RAILROAD GAZETTE

FRIDAY, AUGUST 31, 1894.

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Contributions.

The Goelsdorf System of Compounding Locomotives.

Nathan Manufacturing Co.,
NEW YORK, August 20th, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The article "Independent Exhaust for Two-Cylinder Compounds," signed "T. H. S.," which appeared in your issue of June 22, 1894, was forwarded by us to Mr. K. Gölsdorf, the inventor of the improvement in compound locomotive engines described in your issue of June 1, and he has written us as follows:

"Concerning the comparative hauling power of a two-cylinder compound engine, and an equivalent simple engine, the maximum effect of any kind of locomotive engine will be obtained when the tractive or hauling power represents a value nearly equal to the weight of adhesion, multiplied by the coefficient of friction. The engine will run economically only if the greatest hauling power, corresponding to the limit of adhesion, is obtained with a three to fourfold expansion. The cylinders of a compound locomotive engine, therefore, should be so proportioned that, with a cut-off of about 50 per cent. in both cylinders, the hauling power is equal to from one-sixth to one-seventh of the adhesion, i.e., the area of the high pressure cylinder should be 20 per cent. greater than the area of the cylinder of a simple engine, and then the compound engine will have a hauling power as great as the simple engine. The necessity of providing some systems of two-cylinder compound engines, with complicated and often unreliable mechanisms, in order to convert them from compound into simple engines, or vice versa, is caused only by their having the cylinders too closely dimensioned, resulting in a deficiency of hauling power. If the cylinders and valve gear of a Gölsdorf compound are properly proportioned and constructed, its starting and hauling power will, under all circumstances, be equal to that of a simple engine of equal rating, and will, moreover, have the quality of extreme simplicity, and consequently of reliability.

"The question of employing a relief valve in the low pressure chest, or a reducing valve before the steam gets to the chest, is one of individual preference on the part of the constructor, in selecting special appliances for particular purposes, and has no bearing whatsoever upon the merits or demerits of the Gölsdorf system as a whole.

"Concerning the sufficiency of exhaust, our experience on the continent shows that two-cylinder compounds are as good steamers as ordinary simple engines. Especially on the Austrian State Railroads (compound locomotive, system Gölsdorf) there is always an abundance of steam, even when the engine is worked to its maximum capacity. This is a fact which has a good theoretical foundation: The quantity of air drawn through the grate, or the quantity of fuel burned during the time-unit, depends in the first place upon the energy $\left(\frac{m\,v^2}{2}\right)$ of the steam blowing out durng that time-unit. Whether this energy is exerted during one revolution of the wheels in four parts, or in two parts (compound locomotives), is perfectly immaterial as far as the final result is concerned.

"As to running with one side only, it should be said that the loss of time in preparing an ordinary locomotive for running with one side only is so great that railroads with heavy traffic prefer the use of auxiliary engines in such cases. These preparations are rendered still more complicated by compound engines with or without intercepting valves, starting gears (Mallet, von Borries, etc.), while the Gölsdorf compound is thoroughly accommodating in this respect. In case the high pressure side is disabled, it will only be necessary to set the high pressure slide valve so, that the steam inlet ports be closed. When the low pressure side is disabled, the low pressure slide valve should be moved out of the center sufficiently to uncover *one* of the steam inlet ports, and part of the exhaust passage. In both cases the respective piston should be moved to the extreme end of the cylinder and fixed in that position.

"In the case of simple engines, as well as of compounds, of any system, a train corresponding to the hauling power of the engine can be moved but very slowly, when running with only one side, on account of the small area of auxiliary steam passages leading to the low pressure cylinder. This circumstance makes it appear quite troublesome indeed to run any system of locomotives with one side only, more especially on roads with heavy traffic."

Mr. Gölsdorf, whose above communication is dated August 6, was absent on leave when the article of June 22 was forwarded to him, and hence this delay. We trust that "T. H. S." may find his questions satisfactorily answered by these presents. NATHAN MANUFACTURING CO.

To Prevent Swindling in Railroad Management.

In our issue of July 20 appeared a short synopsis of a bill introduced in the United States Senate by Mr. Cullom, and in the House by Mr. Straus, the object of which is to prevent fraud in railroad management. It appears that the bill was inspired, if not actually drawn by Mr. Isaac L. Rice, and in the August number of the *Forum* is a paper by him explaining its purpose. As we did not have the full text of the bill before us when the synopsis was made we fell into one error as to its provisions, and we make now a somewhat more complete abstract.

The purposes of the bill are: (1) To prevent and to make criminal the sort of financial mismanagement with which we were once very familiar and which unfortunately has recently appeared in a form almost as flagrant as ever. (2) To regulate elections so as to make them free and honest, to give stockholders power over their property and to keep alive the sense of trust and responsibility in the management. (3) Assimilation of the management of railroad properties by receivers to that of directors, relieving the United States Circuit Courts from business management of those properties, except in the administration of justice. (4) Establishment of publicity of corporate affairs under governmental supervision. (5) Initiative on the part of public prosecuting authorities in respect to crimes committed under provisions of this act.

To secure these ends so far as railroads engaged in Interstate Commerce are concerned, the bill provides for the appointment by the Interstate Commerce Commission of examiners, none of whom shall have been a director or employee, in any capacity, of the railroad he is set to examine, within one year before the date of examination. The compensation of these examiners is to be fixed by the commission and paid by the companies examined.

The examiners shall have access to all books and documents and have power to subpœna witnesses and to cause the production of books and documents.

Each railroad company must make quarterly reports in relation to an annual report, verified by the affidavit of the president and secretary, showing in full its financial and business condition, giving in detail assets, liabilities, earnings and receipts from all sources, stating in full operating expenses and all fixed expenses and charges and exhibiting a complete balance sheet. Each of these reports shall be passed upon by the official examiner and countersigned by him and published.

On the appointment of receivers the examiner must make a thorough investigation of the affairs and conditions of the company and of the causes which justified the receivership, and within sixty days he must make a full report of the results of his examination, copies to be filed with the Court, the Interstate Commerce Commission and the Attorney-General of the United States, and a copy to be published at least once in a daily newspaper. If any such examination seems to disclose any breach of trust or violation of the law the examiner must make a circumstantial report at once to the Attorney-General of the United States, and he shall direct the District Attorney to proceed to prosecution of the offender.

Every railroad company shall keep a register of its stockholders, corrected daily if necessitated by transfers of shares, and this book shall be opened to the inspection of every stockholder, and the company must on demand and tender of reasonable payment, make a copy of such stock book for any stockholder or his agent. Failure to comply with this provision makes the company liable to forfeit $100 to the stockholder.

No person can vote unless he is a bona fide owner of shares. Voting trusts are declared illegal; those holding pledges of shares shall not be considered bona fide owners, and when shares are carried on margin the person for whose account they are carried and not the person carrying them shall be considered the bona fide owner. No person can vote on shares registered in his name unless he make oath at the meeting where such vote is offered, or unless his proxy be accompanied by affidavit, that he is the bona fide owner of the shares. In other respects the possibility of fraud under cover of proxies is carefully guarded against. It is made unlawful to pay for a vote on any share or bond or to receive payment for such vote.

In appointing receivers the court shall appoint as temporary receiver or receivers persons who have not been connected in any way whatever with the company within one year before the date of appointment. These receivers shall hold office until receivers designated by the bondholders are appointed, and upon such designation it shall be the duty of the court to immediately appoint the receivers chosen by the bondholders. Careful provision is made that the actual owners of the bonds shall act in this matter.

The accounts of receivers shall be passed on monthly by a master in chancery and any payments improperly made shall be charged against the receiver personally.

No receiver shall interest himself directly or indirectly in the election of officers or directors of the company or in any movement or plan for its reorganization.

It shall be unlawful for any receiver, director, officer or agent to sell short the securities of his company or of any other railroad company engaged in interstate transportation, and where such sale is made on account of the company and by the authority of the directors, the penalty provided shall apply to every director who votes for such authorization.

No receiver, director, officer or agent of a railroad company may have any interest or profit directly or indirectly in any contract or agreement with the railroad company or to which it may be a party. The directors may not purchase the securities of any other transportation company or any other form of property in which any director or officer of the company making the purchase may be interested, and in fact no buying or selling can be done in which the officers of the railroad company are interested parties.

No director or officer of a railroad company may purchase or sell any stock or bonds for the account of that company without the special authorization of the board of directors, and purchases on margin for the account of the company are prohibited.

Violation of any of the provisions of this act is made a misdemeanor and conviction carries a fine of not less than $5,000 or more than $20,000 and liability to imprisonment for not less than one year or more than five, or both fine and imprisonment.

In supporting this bill Mr. Rice says that annual elections and legal redress by suits at law, and interventions in receivership proceedings have broken down as means of protecting the rights of security holders, for elections may be controlled by numerous well-known means; suits at law are costly and uncertain, and receiverships are subject to even greater difficulties than proceedings against directors. All of these points he develops at considerable length. He makes a very strong illustration of the possibilities of financial mismanagement, using two or three actual cases, and especially the recent case of the Reading.

It is the purpose of the *Forum* to follow up this article with further discussion of the principles involved in the bill and of the provisions of the bill itself, and to that end the editor has sent out a number of questions to railroad men and others throughout the world. We have no doubt that the result will be a valuable discussion, and we trust that it will lead to important reforms.

North Dakota Railroad Commissioners' Report.

The Railroad Commissioners of North Dakota, Peter Cameron, N. P. Rasmussen, and B. B. Stevens, have issued a special report for the calendar year 1893, a copy of which has just reached us. The fiscal year of the State has been changed to end on December 30, but the commissioners thought best to make a report for the calendar year. When they will begin making reports on the new basis is not stated. A brief summary is given of the business of the six railroads operating in the State, as reported by the companies. Considerable space is given to reports of the annual inspection of the roads by the commissioners. Most of the roads were found in good condition, but some branches are stated to be "in very bad condition, even unsafe." According to the law the commissioners give notice in the newspapers when they are going to inspect a road, and at scores of stations delegations of citizens were on hand to present petitions and complaints in great variety. A considerable portion of the report is taken up with the affairs of grain shippers. Complaints of lack of freight cars have not been so frequent as formerly, owing largely to the short crop. A list is given of all the leading platforms in the State, and the warehouse rules established by the Board are printed in full, together with a list of all grain warehouses in the State. Thirty pages are devoted to complaints and petitions, every incident of the kind being reported in full apparently. The laws affecting the railroads, passed by the last Legislature, are appended to the report.

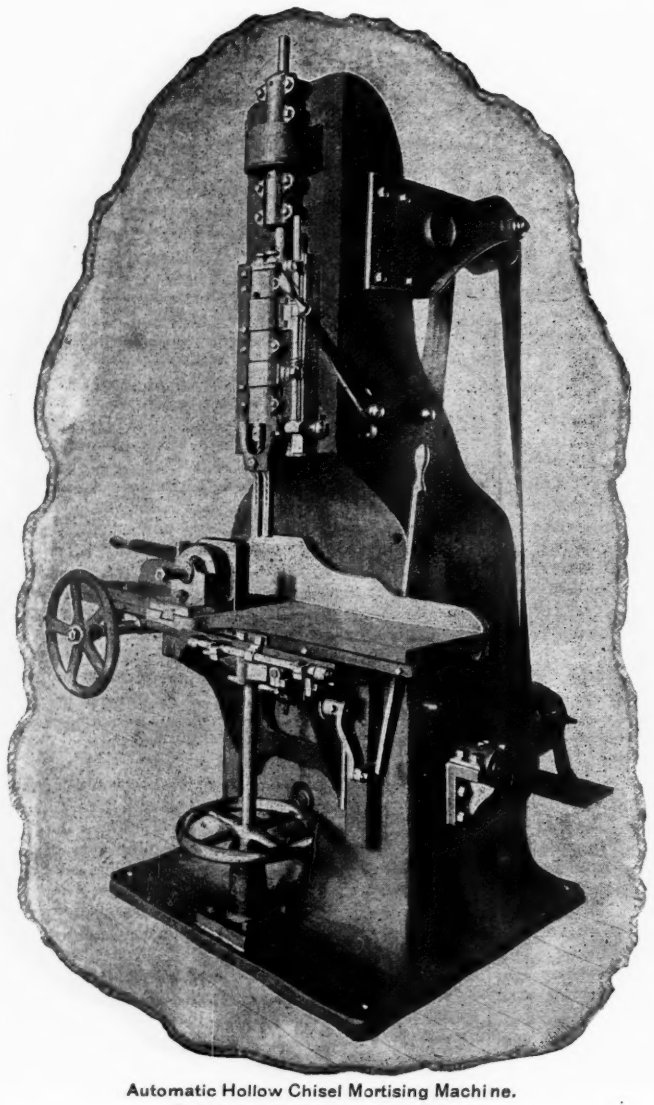
A Double Automatic Hollow Chisel Mortising Machine.

We illustrate herewith a new style of hollow chisel mortising machine recently brought out by the firm of Greenlee Bros. & Co., Chicago, and having several features not heretofore used on wood-working machinery.

The plunger holding the tools has an automatic reciprocating motion with a quick return, the location and length of stroke being easily changed on the vertical rod. The machine is built with either one or two hollow chisels. In machines having two chisels the bits are driven by gears running at the very high speed of 5,000 revolutions a minute. The mandrel boxes are finely fitted, have

universal adjustments for lining and are thoroughly lubricated.

The table for holding the work rests on ball bearings and moves to adjustable stops laterally and transversely so that the work requires no laying out. All bearings are self oiling and the oil holes fitted with dust covers. The belt driving the mandrels has an automatic tension device and the countershaft, with tight and loose pulleys, has an outside bearing. The machine is very powerfully and well built to stand the high speed at which it operates without vibration or noise.. The machine we illustrate, together with several others, has recently been placed in the new wood-working mill of H. K. Porter & Co., Pittsburgh, Pa.



Automatic Hollow Chisel Mortising Machine.
By GREENLEE BROTHERS & CO., *Chicago.*

Frictional Resistance on Cable Roads.

Outside of the general offices of cable railroads very little is known concerning the frictional resistance, and the distribution of such resistance on cable roads; it is with the intention of placing on record some information concerning the power required to drive cables in street railroad service that the accompanying table has been prepared. The cable railroads generally keep a daily record of the power developed and it is from these daily records that the table is compiled.

The data given were taken at four different power stations, representing eight different cables, the data for each cable represents observations from starting time in the morning till stopping at night, about 20 hours. The horse power necessary to drive each cable was found by subtracting the frictional horse power of the engine and machinery from the horse power developed in driving the cable in the morning before any cars were put out.

The length of the cable in each case is given as are also the speed of cable, the degree of curves and number of curves and total curvature. Diagrams are taken from the cylinder of the engines at intervals during the day, and the figures given in the columns for maximum and minimum horse power developed, are the extremes observed. The column "average per car on line," was obtained by dividing the net horse power by the number of cars on the road at the time the diagrams were taken. It is impossible to say how many cars were attached to the cable.

One point shown by the table is the improvement in a new plant over the older ones. Power station No. 3 is a new one and it will be observed that 26,420 feet of cable, with no curves but running at 12 miles an hour, require but 22.28 horse power, whereas at power station No. 1, practically the same length of cable, with no curves, and running 10.5 miles an hour, requires 98.00 horse power. The greater speed of the former will reduce the friction somewhat. At power station No. 3, it will be observed, 21,850 feet of cable is driven 10 miles an hour, with an expenditure of 52.15 horse power, whereas, at the same station, 12,000 feet of cable running at the same speed but with two curves of 90 degrees and two of 45 degrees, requires 98.75 horse power to drive it. This latter comparison will give some basis for calculating resistance of cables due to curves.

The variation in power developed between 4:30 a. m. and 7:30 a. m. is shown by the following data: 4:30 a. m., total horse power developed, 124.36, at 6:30 a. m. 638. h. p., at 7 a. m. 824. h. p., at 7:30 a. m. 773. h. p. The power required continues to decrease, reaching a minimum in the middle of the day, and increases again, reaching a maximum at about 6 p. m. The grip cars used on these lines are combination passenger andgrip cars, weighing about 16,000 pounds. Generally two trailers are attached, each weighing 8,000 pounds and carrying as a maximum from 90 to 100 passengers each. There are no natural grades to be surmounted on any of the lines.

FRICTIONAL RESISTANCE ON CABLE ROADS.

Station.	Engines in Station.	Horse power of each.	Cable, feet.	Speed, miles an hour.	No. of Curves and radii.	Total Curvature.	Horse Power. To drive cable.	Horse Power. Engine and machinery.	Horse Power. Total.	Horse power for 20 hours. Maximum.	Horse power for 20 hours. Minimum.	Horse power for 20 hours. Average per car on line.	Total frictional h. p. divided by maximum h. p.
No. 1.	2	1,200	26,000	10.5	None.	None.	98.	53.32	238.32	1122.00	238.32	3.58	21.24
			18,500	10.7	None.	None.	87.						
No. 2.	2	1,000	20,000	10.5	10 Parabolic, radii as follows: 100′-75′-55′	2 of 90° 2 of 45° 4 of 90° 2 of 45°	118.100	72.00	345.65	1340.00	686.00	5.00	25.79
			20,000	12.83	50′-55′-75′-100′		155.55						
No. 3.	2	1,500	21,850	10.	4 Parabolic, radii as follows, 100′-75′-100′	None. 2 of 90° 2 of 45° None.	52.15	38.32	211.51	556.0	357.0	3.34	38.04
			12,000	10.			98.75						
			26,430	12.			22.28						
No. 4.		1,000	9,475	6.75	10 Circular 51 ft. radius.	10 of 90°	171.00	63.00	234.5	821.00	234.5	5 1	28.56

Books on Bridges.

BY PROF. HENRY S. JACOBY, CORNELL UNIVERSITY.

(*Continued from page 560.*)

4. On Bridge Design and Construction.

Pope, T. Treatise on Bridge Architecture. New York, 1811. This contains descriptions of a number of early wooden bridges and of the author's "patent flying pendent lever bridge." The book is mainly valuable as a historical record.

Duggan, G. Stone, Iron and Wood Bridges of United States Railroads. New York, 1850 Drawings of bridges built during the preceding decade, with brief descriptive notes.

Vose, G. L. Manual for Railroad Engineers. 19+570. Boston, 1873. About one-quarter of this book refers to bridges and their foundations. The 31 plates constitute a separate volume, 23 of which give the plans of nearly as many combination and wire bridges with various types of trusses. The first edition was published in 1857 under the title of Handbook of Railroad Construction.

Roebling, J. A. Long and Short Span Railway Bridges. 2+50+13 p. 13 pl. large folio. New York, 1869. Several proposed designs of bridges, with suspension cables combined with parabolic trusses, with estimates of weight and cost, one of these being proposed for the Mississippi River at St. Louis. Tables of comparative weight and cost are also given for shorter trusses without cables.

Cooper, T. American Railroad Bridges. 60 p. 26 pl. 8°. New York, 1889. This book is a reprint of a paper in the Trans. Am. Soc., C. E., 1889. It contains a valuable sketch of the history and development of bridges in this country, together with the detail drawings of a number of representative types of the earlier wooden and iron bridges. It also reviews the design, manufacture and erection of bridges, and discusses the relative merits of typical American railroad bridges as well as the failure of bridges. The appendix gives an abstract of recent tests on full-sized bridge columns and eye-bars.

Merrill, W. E. Iron Truss Bridge for Railroads. 130 p. 9 pl. folio. New York, 1870. Calculations on the comparative theoretical economy of seven types of simple trusses.

Bender, C. B. Principles of Economy in the Design of Metallic Bridges. 195 p. 12 pl. 8°. New York, 1885. An investigation is made of the relative economy of several kinds of bridge trusses. More than one-quarter of the book is devoted to the economic proportions of cantilever bridges, which is followed by a similar consideration of arch and suspension bridge girders and of a cantilever arch bridge of the same span as the Forth bridge. A review of the experiments on steel and iron stringers and floor beams made by the Dutch Government in 1878-'79 is added as an appendix.

Crehore, J. D. Mechanics of the Girder. 14+575 p. 8°. New York, 1886. More than half of this work is on the mechanics of the beam and column and on stresses in simple trusses, the remainder consisting of computations of the weights of bridges and a determination of their economic proportions for a given span and assumed live load and wind pressure.

Weyrauch, J. J. (Du Bois, A. J., Translator.) Strength and Determination of the Dimensions of Structures of Iron and Steel with Reference to the Latest Investigations. 15+210 p. 4. pl. 8°. New York, 1877. A discussion of the allowable working stresses and methods of dimensioning, with reference to the experiments of Wohler and Spangenberg, and of shearing strength and rivet connections. There is also an appendix on the strength of materials.

Waddell, J. A. L. Designing of Ordinary Iron Highway Bridges, 1st ed., 1884. 4th ed., 17+252, p. 7, pl. 42 plates of tables. 8°. New York, 1889. The subject of details of construction and the complete design for a pin bridge cover 102 pages, the other topics treated being loads, specificating bridge lettings, order and shipping bills, working drawings, erection, maintenance, etc., Elaborate tables are inserted to facilitate the labor of design. The plates show detail drawings of four bridges and a false work.

Boller, A. P. Practical Treatise on the Construction of Iron Highway Bridges. 148 p. 8°. New York, 1876. An elementary treatise, intended for town committees, giving a description of the construction of the superstructure and treating of the conduct of bridge lettings, bridge maintenance and the architecture of bridge building.

Hiron, J. Plate Girder Construction. 94 p., 2 pl., 24°. New York, 1888. A complete design and estimate of weight and cost for a span of 50 feet. The edition of 1893 is almost entirely rewritten.

Bender, C. Proportions of Pins used in Bridges. 52 p., 24°. New York, 1873.

Wolcott, W. C. Treatise on Wooden Trestle Bridges. 160 p., sq. folio. New York, 1891. On their design, construction, erection and maintenance, together with specifications and estimates of cost. There are 38 plates giving an equal number of standard plans accompanied by their bills of material.

Baker, J. O. Treatise on Masonry Construction. 17+552 p., 6 pl., 8°. New York, 1889. The four parts are on the materials of masonry, on preparing and using the materials, on foundations, and on masonry structures. In the fourth part two chapters are on bridge piers and abutments and one on masonry arches, the remaining three chapters referring to masonry, dams, retaining walls and culverts.

Patton W. M. Practical Treatise on Foundatons. 19+410 p., 22 pl., 8°. New York, 1893. The first part is on the materials in foundations, masonry, retaining walls and arches, the second part on timber foundations, and the third part on deep and difficult foundations. Considerable prominence is given to quantities of materals and cost, while the description of methods of construction relates to the best recent practice. Numerous plans are shown in the plates.

Clarke, T. C. Account of the Iron Railway Bridge Across the Mississippi River at Quincy, Ill. 71 p, 21 pl., 4°. New York, 1869.

Chanute, O., and Morison, G. S. Kansas City Bridge. 140 p., 12 pl., sq. 8°. New York, 1870.

Woodward C. M. History of the St. Louis Bridge. 20+391 p., 47 pl., sq. fol. St. Louis, 1881. The sub-title reads: Containing a full account of every step in its construction and erection, and including the theory of the ribbed arch and the tests of materials The plates consist of photographic views and detail drawings.

Morison, G. S. Plattsmouth Bridge. 2+36 p. 25 1 p. 2188. Bismarck Bridge. 2x44, p. 26 pl. 1884. Blair Crossing Bridge. 2x25. p. 19 pl. 1886. New Omaha Bridge. 28 p. 26 pl. 1889. Rulo Bridge. 30 p. 23 pl. 1890. Sioux City Bridge. 17 p. 18 pl. 1891. Cairo Bridge, 53 p. 38 pl. 1892. Nebraska City Bridge. 25 p. 21 pl. 1892. All of these reports are oblong folios measuring 40 by 56 c. m. In addition to the history of the project and description of the structure there are usually given the tests of materials, the record of progress in sinking the caissons, the ma-

terials used in the foundations, the specifications, and the cost. Sometimes the record of borings is added. The plates contain plans of the caisson and piers, general detail drawings of the superstructure and a few other auxiliary drawings.

The two monographs which follow, as well as those preceding Morison's in this list, have about the same general range of topics.

Hutton, W. R. Washington Bridge. 96 p. 63 pl. sq. Folio. New York, 1889. The plates comprise 26 Alhertypes and 37 double and single page lithographs, showing complete detail plans.

Boller, A. P. Thames River Bridge and Approaches. 44+17 p. 15 pl. obl. 4°. 1890.

Merriman, M., and Jacoby, H. S. Roofs and Bridges, Part III. Bridge Design. 400 p. 18 pl. New York, 1894. The first few chapters give the history and development of bridges, the principles of economic design, and a number of tables of standards. Four designs (roof-truss, plate-girder bridge, pin bridge and riveted bridge) are worked out in all their details, in accordance with different standard specifications and are accompanied by their general drawings. Several chapters on bridge lettings, shops and buildings, shop practice and on class-room designs follow. The balance of the work contains seven examples of bridges, in addition to elevated railroad structures, constructed by different bridge companies, the data, specifications and drawings being given in each case. Only simple bridges are considered in this volume.

For the history and development of bridges consult the article "Bridge," in Johnson's Universal Cyclopedia, 1893, and in other encyclopedias.

No effort has been made to complete the list of books relating to stone bridges, as that would extend the list unduly. Additional reference may be made to works on stereotomy and to several numbers of Van Nostrand's Science Series.

The following is a partial list of foreign works, most of which are of recent date. The old work of Hunter is added, as it contains the plans of so many important English bridges.

Stoney, B. B. Theory of Strains in Girders and Similar Structures. Rev. and enl. ed. 61+632. 5 pl. 8°. New York, 1873. While no detail drawings are given, the form and construction of bridges are discussed. A large part of the work relates to the strength of materials.

Fidler, T. C. Practical Treatise on Bridge Construction. 24+432 p. 12 pl. 8°. London [1887]. About one-fifth of this book relates to the dimensioning of the sections of main bridge members. No drawings of details are given. The larger part deals with elementary statics, strength of materials, stresses in trusses (including arches, suspension, continuous and cantilever bridges), and formulas and tables on the theoretic weight of bridges.

Auglin, S. Design of Structures. 23+497 p. 12°. London, 1891. About one-quarter of the contents refers to construction and erection, the remainder being about equally divided between mechanics of materials and stresses in roofs and bridges. The practical details in the chapter on roofs consist mainly of the loads and roof covering, while those on bridges are mainly the loads and working stresses and an elementary description of some constructive features. There are no detail drawings shown. The sub-title is: Practical treatise on the building of bridges, roofs, etc.

Hutchinson, E. Girder Making and the Practice of Bridge Building in Wrought Iron. 8+184 p. 8°. London, 1879. The first part relates to the materials and workmanship of girders and the second part gives brief descriptions of a number of bridges, almost exclusively of the riveted type, manufactured at the Skerne Iron Works in England, with reference chiefly to practical considerations affecting their form and construction. All theoretic questions of design are excluded.

Phillips, P. Forth Bridge, obl. Folio. Edinburgh. No date. This is an edition de luxe consisting of 55 plates of fine photographic reproductions called photophanes, accompanied by about one hundred pages of letter press printed only on one side of very heavy paper; 38 of these plates show the "Forth Bridge in its various stages of construction," and on the rest this bridge is compared with twenty-seven of "the most notable bridges of the world." The text is a very brief descriptive sketch.

Westhofen, W. The Forth Bridge. 71 p. 19 pl. sq. folio. London, 1890. This is reprinted from a special number of *Engineering* and gives a history and description of the design and construction. It is illustrated by numerous views.

Barlow, C. New Tay Bridge. 4+46 p. 23 pl. large, folio. London, 1889. A course of lectures delivered in 1888, giving a brief history and description, accompanied by 22 reproductions of photographic views.

Humber, W. Complete Treatise on Cast and Wrought Iron Bridge Construction. V. 1. Text. 13+237 p. 16 pl. folio. London, 1864. V. 2. Plates. 1 colored plate, 80 double page plates. The theoretical part of this treatise is on the determination of stresses, the strength of iron and steel, and tables of weight and cost of various bridges. The practical part is on designing, manufacture, details of construction, and metallic piers and foundations. The descriptive part refers to 22 bridges, most of which are in Great Britain and her colonies, whose detail drawings are shown on the plates.

Heinzerling, F. Die Brucken der Gegenwart. 825 p. 78 pl. large folio (47+31 c.m.). Leipzig, 1882-'91. This work was issued in ten parts and covers the entire subject, both as to kinds of bridges as well as to the material of which they are built. Each part includes in its treatment the history and development, determination of stresses, construction, description and numerical computations for selected examples, estimate of weight and cost, specifications and erection, testing and maintenance, followed by references to the literature. The double-page plates contain dimension detail drawings, the structures shown being selected from other countries as well as Germany.

Schaffer, T. and Sonne, E. Der Bruckenbau. (Vol. II. of Handbuch der Ingenieur, Wissenschaften). In five parts. 1812 p. 77 pl. 4°. Leipzig, 1886-'90. This work is similar in character to the preceding.

Morandiere, R. Traite de la Construction des Ponts et Viaducs. Text in 2d V. 7+1891 p. Folio. 332. Plates in 2d V. large folio (54x35 c. m.). Paris, 1888. Includes bridges in stone, wood and metal for roads, canals and railroads. The plates give the detail drawings of a very large number of bridges in France and other countries. The text is chiefly limited to a general description of the structures.

The last three works in this list are all quite elaborate, and together give the principal details of the leading bridges of the world.

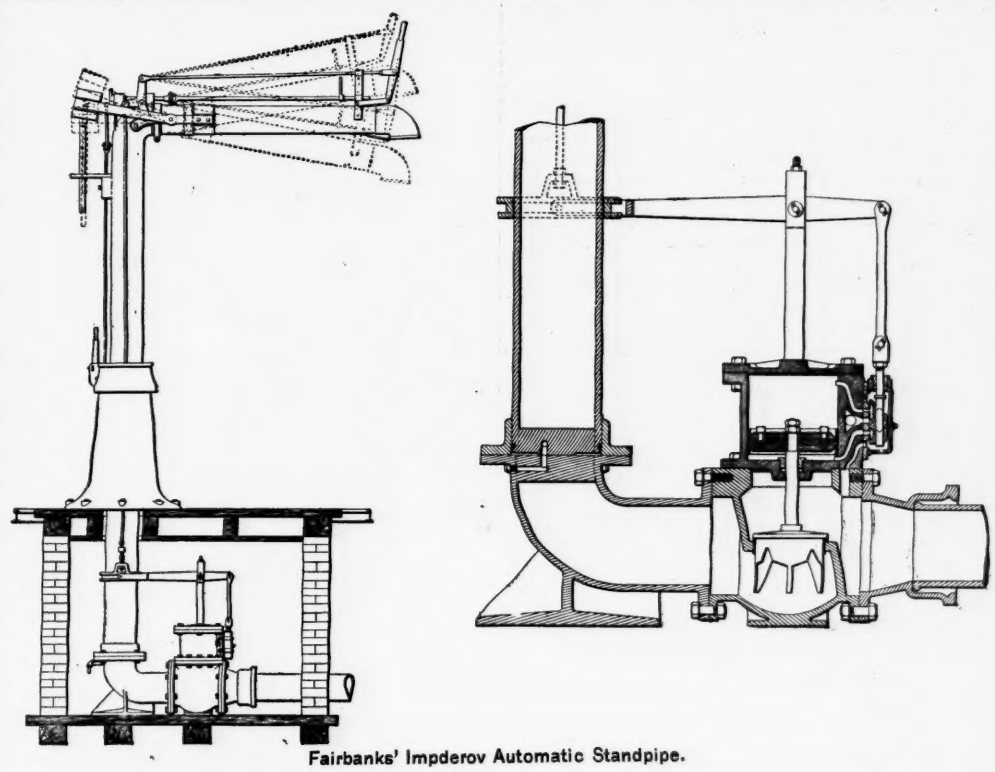
The Fairbanks, Morse & Co., Stand-Pipe.

The accompanying illustrations show the general appearance and several of the features of the construction of a stand-pipe for water stations, brought out by Fairbanks, Morse & Co., of Chicago, and now in use on several important roads.

The top or cap of the base is bored to fit loosely on the pipe and carries a locking-dog which drops by gravity into recesses in the top of the base, these recesses being so placed that the pipe is locked when standing parallel with the track. The locking-dog is operated from the outer end of the drop pipe by the fireman, who pulls toward himself a vertical loop which rotates a small shaft extending back to the upright pipe and terminating in a crank, the shaft being made flexible by means of an universal coupling at the hinge joint, connection between crank and locking-dog being made by a jointed rod. This device prevents the pipe when not in use from swinging around in the way of passing trains. There are no springs or inclined planes to resist the free rotation of the pipe into position to deliver water.

The upright pipe rests upon a centre bearing, the lower end being provided with a metallic packing ring in a short case, permitting the pipe to still rotate freely in case it should be accidentally knocked out of perpendicular to a slight extent.

The main valve, which we show in section, is fitted with a simple appliance by which the pressure contained in the pipe is used automatically for opening and closing the valve, thus dispensing with the use of levers or of screws generally used for operating the main valve of standpipes. The valve is controlled by means of the short levers above the mouth of the spout, which operate, through a system of rods and levers, the small auxiliary valve at the right of the cylinder above the main valve. This auxiliary valve admits water from the mains to the upper or lower side of the piston as may be required and closes or opens the main valve. The size of the passages is so proportioned that the valve will receive a quiet, easy motion, and, in order to avoid the use of safety valves or air chambers the main valve is so constructed that the flow of water through it will be gradually increased or decreased. It will be seen that the valve is independent of the operating parts and can receive no abuse from those operating it.



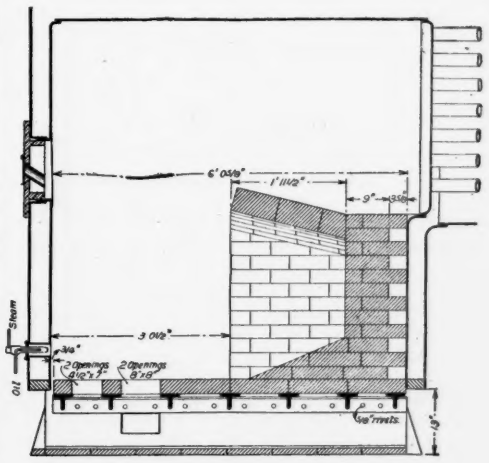
Fairbanks' Impderov Automatic Standpipe.

At the upper turn of the pipe is introduced a flexible joint of pure rubber, prepared by special process, so that it does not break or become injured by any degree of cold. The weight of the spout is carried by lugs and levers outside of the flexible joint and is counterbalanced by weight adjusted on levers so that the spout, when not being used, is elevated and all drip is returned to the pit, thus saving ice formation in winter. This flexible joint allows of a great variation in height of tenders and can be adjusted to swing over freight and baggage car roofs without the moving of trains.

The pipe is made frost-proof by the use of a drain operated automatically with main valve, by which the pipe is emptied in a few seconds. This drain can be closed in summer if desired. The operating parts are all on the outside of the pipe, and made of wrought iron, of the simplest form. All parts in contact with water are of bell metal.

Oil for Fuel on Locomotives.

The use of oil for fuel on locomotives has received some attention from railroad companies recently, owing in part to the fact that the strike in the soft coal regions reduced the supply of coal on hand. Many roads began to burn wood in their switching and work-train locomotives; some, that ordinarily burn bituminous, bought anthracite for such service, and at least one of the roads made experiments with fuel oil. That fuel oil can be burned successfully on locomotives, there is of course no doubt, but that it can be burned economically, depends on the price of the fuel which it is to replace. A close estimation is that fuel oil at 1¼ cents a gallon will make the cost of a horse power-hour about the same as with coal at $1.75 a ton; this is for stationary boiler service under the ordinary conditions, using bituminous coal; no tests have been made of the value compared with anthracite coal.



Locomotive Furnace for Burning Fuel Oil.

The Standard Oil Co., of Indiana, has five switching locomotives doing switching work about the company's extensive refineries at Whiting, Ind., and these locomotives have been using oil for fuel for several years. The only alterations necessary to convert a coal-burning locomotive into an oil-burning one are the changes necessary in the firebox and in the tender. The latter change is easily and quickly made by placing a tank for the oil in the coal space of the ordinary tender. The illustration shows the arrangement in the fire box.

The grate is covered with fire brick, leaving only five openings at the back end, two 4½x7 inches, two 8x8 inches and one ¾ inch wide. Both sides of the fire-box, where the blast strikes direct, are protected by a single thickness of brick and an arch is sprung over the top. The engraving does not show clearly the construction of the front wall; instead of two-thirds of its thickness being solid and checker-work next to the sheet, it is checker-work throughout, to allow the heat to get to the sheet but to prevent the direct blast from the burner striking the sheet. The burner is at the back end and nearly at the bottom of the fire-box. A 2-inch tube is expanded into the inside and outside sheets and through this tube extends the burner. The essential feature, the combining tube, is of very simple construction consisting of a tube in which the steam combining with the oil atomizes it and the two are blown into the furnace where the oil is consumed. The oil is led into the centre of the combining tube and directed toward the furnace, the steam surrounds the oil to the point where they are combined. There are many costly burners offered for

sale, but the one shown is serviceable and is cheaply made. The engraving shows a single burner. A larger number, generally four or six, is necessary for a locomotive.

When more than one is used, a single combining tube passed through the water leg and a T, pointing to each side, is put on just inside of the sheet: the desired number of burners may be connected with the two branch pipes thus formed. The rate of flow of steam and oil to the combining tube is regulated by valves conveniently located for operation by the fireman. When the two valves are closely regulated there is no smoke from the stack. With this arrangement a locomotive in switching service burns from 27 to 30 gallons of oil an hour. The present cost of fuel oil is about 1¼ cents a gallon.

Punching as a Means of Testing Structural Steel.

ABSTRACT OF A PAPER BY MR. T. L. CONDRON.

It will be remembered that Mr. A. E. Hunt, of Pittsburgh, read at the Engineering Congress in Chicago last year a paper on "A proposed Method of Testing Structural Steel" an abstract of which appeared in the *Railroad Gazette*, and which has since been published in the *Transactions* of the American Society of Civil Engineers. Mr. Hunt's proposition was to test steel by punching or otherwise shearing, cutting or drifting and comparing the force required with that required to treat the standard pieces and to compare the work done. The proposition was so novel that it excited a good deal of interest. There seemed to be a possibility of getting a greater number of tests than by any other method, in fact of testing all the material as it is worked in the shop. The plan was suggested by observation of the different performance of plates from the same lot and indeed of different parts of the same plate under the punch. Obviously, the method has great advantages if results of any value can be got from it. Mr. Condron, in the paper before us, confined his investigations to punching, with a view to establishing the relation between resistance to punching and tensile strength, and also to measuring the work done in the tests. The paper in which he has described his investigations was read before the Engineers' Club of St. Louis last May. It was used as a thesis at the Rose Polytechnic Institute, and secured for Mr. Condron the degree of M. S. At the time the paper was presented to the St. Louis Club he was instructor in the school of Engineering at Washington University, St. Louis, but has since become the resident engineer in Chicago of the Pittsburgh Testing Laboratory.

In August of last year Mr. Condron began the series of tests at the Pittsburgh Testing Laboratory on an Olson testing machine and an Emory testing machine of the Upper Union Mills of the Carnegie Co. The tests on the Emory machine were especially to study the effect of different speeds in punching. After these preliminary tests the same specimens were punched on the Riehlé 100,000-lb., testing machine of the Rose Polytechnic Institute, which has a Gray autographic recording attachment. All of these preliminary tests were considered unreliable on account of the crudeness of some of the apparatus.

On returning to St. Louis Porfessor J. B. Johnson detailed two "fifth-year" studuents in the department of civil engineering to assist in Mr. Condron's further investigations, and he and Captain Hunt contributed a considerable part of the money for the expenses of the work. The students who helped Mr. Condron were Mr. F. F. Harrington and Mr. Guy N. Norton, and all of the investigators were at some expense besides the time and labor that they contributed.

A punching apparatus and a recording attachment were designed to use with the 100,000-lb. Riehlé universal machine of the Washington Univesity and the apparatus seems to have been very well designed and made, as no measurable variation is shown in the regularity of the ordinates or in the recording of the movement of the punch. It was especially desired to get the actual penetration of the punch into the specimen and this involved elimenating the compression in the apparatus itself under all loads. Much ingenuity was displayed in getting over this difficulty. The records obtained are tabulated, but we do not reproduce the tables. The shearing strength per square inch was obtained by the following formula:

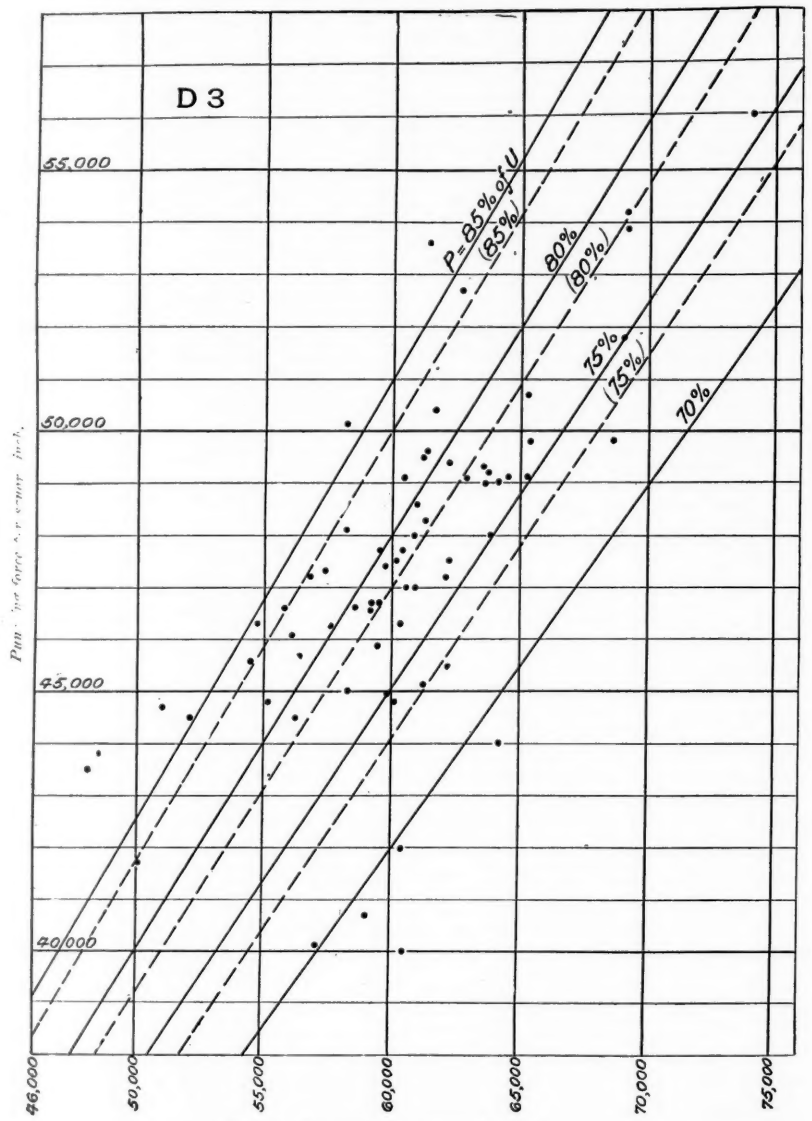
$$P = \frac{\text{Force required to punch.}}{3.1416 \times \frac{\text{Diam. of punch} + \text{Diam. of die.}}{2} \times \text{Thickness of plate.}}$$

Diagrams plotted from oberved results compared with theoretical lines calculated by the formula seem to demonstrate that the force required to punch varies directly as a constant multiplied by the diameter of the punch multiplied by the thickness of the plate.

Of one set of diagrams presented the writer says: These three plates demonstrate graphically that the force required to punch varies directly as a constant into the diameter of punch times the thickess of plate.

Plate A1 [Not reproduced.—EDITOR.] is interesting as showing the high elastic limit as determined by the drop of the beam in the testing laboratories of the mills. The writer is convinced that this feature of mill reports is so thoroughly unreliable as to have no value whatever to the engineer. In his experience he witnessed two series of tests made in duplicate where a question had arisen concerning a large order of steel plates. There were 40 specimens in each series. One set was tested in a mill testing room upon a high speed Olson machine, the poise being run out by hand. It was simply inspiring to see how skilfully the operator could catch the elastic limit. The fact of the matter was that he had all he could do to keep up to the rapidly increasing load with the poise. As soon as he succeeded in overtaking the same he called out the figure supposed to be the elastic limit. The 40 tests were made in 30 odd minutes including calipering the specimens. The second set of specimens was tested by one of the inspection bureaus upon another Olson machine of slower speed and equipped with an electrical device for balancing the scale beam. A remarkable cincidence was found between the averages of the two series with respect to ultimate strength, the two averages differing by only 36 pounds, the greatest difference between any two corresponding plates being 3,100 pounds. But with regard to elastic limit the case was different. In the second series the elastic limit was also determined by the drop of the beam, but the beam was controlled by the automatic device referred to. By this means it was found to be just about 5,000 pounds lower on nearly every plate than in the other series, and the two averages differed by just about the same amount.

This brings us to the set of plates designated as D1, D2, and D3, which are the most important of the entire series. Plate D1 shows graphically the record, so far as the



force required per square inch of area sheared is concerned, of 568 tests made upon 70 plates, and so arranged as to show at a glance the relation which the force required for punching bears to the ultimate tensile strength. As will be noted these plates ranged in tensile strength per square inch between 46,000 lbs. and 75,000 lbs. while the range in thickness was from ¼ inch to ¾ inch. Plate D3 is the same as D1 except that only the average value of P for each plate is plotted.

According to this extensive set of tests the average shearing strength of all these plates as found by punching would appear to be about 80 per cent. of the tensile strength, ranging principally between 75 per cent. and 85 per cent. but increasing for very soft steels and decreasing for hard steels. There are a number of exceptions to this rule and a careful study of these exceptions has failed to show any explanation for most of them except that for very thin plates it generally increases and for very thick plates it generally decreases. An unexpected feature of these results is that they show such a high per centage for the shearing strength to the tensile strength of the plates tested. On plate D2 have been plotted all of the results made by Captain Hunt and published in his paper before referred to. For our purpose now we will only consider the results given in his table "B" which belong to plates of good soft steel between 50,000 lbs. and 70,000 lbs. tensile strength. In this table are given the values of shearing strength per square inch obtained by the same formula as was used in the calculations of the tests made at Washington University. Instead of plotting the results for each test included in this table the average value of P for each plate has been plotted and appear as black dots. It will be seen that these dots cluster along the 75 per cent. line with more between 75 per cent. and 80 per cent. than between 70 and 75 per cent. There must be an explanation of this difference between the results of thetwo sets of experiments. Granting that the two testing machines used are both well within the necessary degree of accuracy, so that 40,000 lbs. on one is the same as 40,000 lbs. on the other, then, the explnation must be found in the fact that the equation is in error. The one distinctive differenace between the punches used by Captain Hunt in his tests and those used here, is that for the former the dies had diameters ⅛ of an inch greater than the diameters of the punches, while for those used here the diameters of the dies were but 1-16 of an inch greater than of the punches.

There has recently appeared in the *Engineering News* the very excellent paper by Mr. Geo. S. Allen upon "Tests of Punches of Different Forms" in which Mr. Allen states that he found that between the limits of 0.01 and 0.50 inches clearances there was no changed in the force required to make a punching. He used only ¾ inch punches. This being true it is not correct to use the mean of the diameter of the punch plus the diameter of the die, as has been done in all of these computations, for although it seems well established that the force required is not affected by increase in clearance the value of the shearing strength per square inch is very materially affected. If the former equation is changed to:

$$P_1 = \frac{\text{Force required to punch}}{3.1416 \times \text{diameter of punch} \times \text{thickness of plate.}}$$

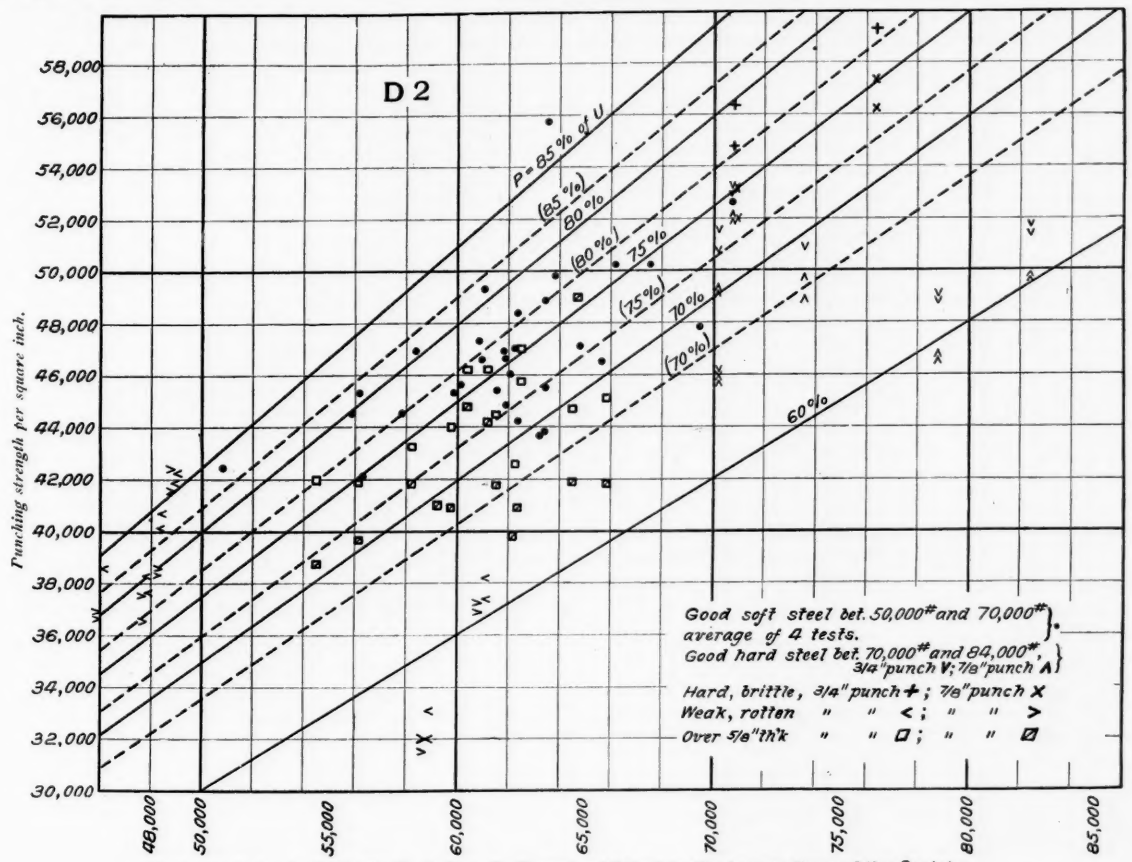
then all the values of P would be increased.

This means that Captain Hunt's results are all 4 per cent. lower than if the diameter of punch had been used instead of a mean diameter between punch and die, and that all of this series of results are 2 per cent. lower on the same basis, and furthermore that the two could only be compared by bringing them to the same standard. This has been done by drawing the dashed percentage lines of the Plate referred to. Now it will be seen that all of the tests on Plate D2 indicated by black dots fall between the new 75 per cent. and 85 per cent. lines with but three exceptions. On D1 it is seen that while the mass of tests still lies between the new 75 per cent. and 85 per cent lines a good many fall above 85 per cent.

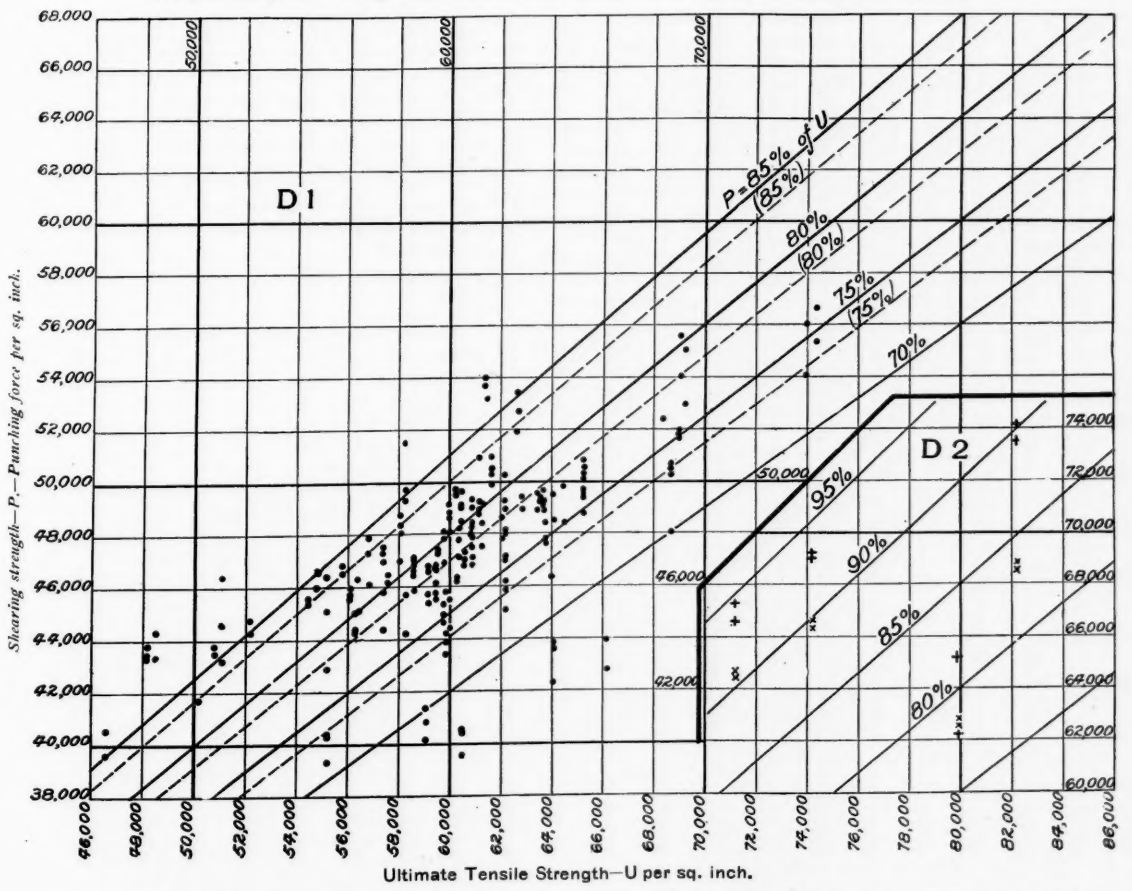
While this is an interesting field for study it is not likely that from the force required for punching even when reduced to shearing force per square inch it will be possible to establish any system of testing that will meet the requirements of engineers. It was especially to the force into the distance through which it acted that the writer looked for a well-defined relation. He had hoped by this series of tests to establish some reliable relation between the work done taken in connection with the maximum force applied and the ductility as well as tensile strength of the material tested. . .

It was hoped that the point of rupture on the diagrams [not reproduced.—EDITOR] would be clearly enough defined to enable a closed figure to be made of each, and by measuring this enclosed area determine the work done. So large an error results from a small error in determining just where this point or cut off should be that it must be admitted that the effort to determine any law for the amount of work done in punching by integrating these areas has been unsuccessful. In order to obtain strain diagrams of punching which will be sufficiently accurate to enable a careful study to be made of the enclosed area it will be necessary to so design the recording device that it will be perfectly automatic and so eliminate all the errors due to the personal equation of the observer. The writer still believes that it will be possible by using an autographic recording device, which shall be sufficiently sensitive as to record accurately the penetration of the punch with the corresponding load, to determine the area of such closed curves and to learn by these areas the most important facts concerning the steel punched. What is also an important point, but one not yet fully established, is that such curves will indicate to the eye by a glance not only the shearing strength of the metal, but its other properties, such as ductility or brittleness.

A special piece of apparatus has just been received by the writer for further investigation along this line. It is an hydraulic indicator made much the same as a steam engine indicator, but much heavier and stronger, and capable of measuring pressures beyond the maximum upon the piston of the 100,000 lbs. testing machine viz.: 2,000 lbs. per sq. inch. This indicator reached him too late for any tests to be made in time for this paper. It is his desire to present a report of such tests at a later meeting. Until such a series of tests has been made it seems unwise to present any very elaborate conclusions and therefore the same will be referred till such time as will enable a broad statement to be made concerning whether the indications of a definite relation existing between the resistance of steels to punching and the ultimate tensile strength, elongation and reduction can be verified, and a definite specification for punching strength suggested, or until it can be definitely proven that punching cannot be looked to as a means of determining the fitness of material for structures.



Tests made by A. E. Hunt, M. A. Soc. C. E. and published in the transactions of the Society.



Being the averages of three Tests each with 5/8 inch, 3/4 inch, 7/8 inch. and 1 inch Punches; Diameter of Dies—Diameter of Punches, 1-16 inch.

Before closing this paper the writer wishes to acknowledge the valuable assistance he has received from those who have shared in the attending expenses, a very large proportion of which amount has been contributed by Prof. J. B. Johnson and Captain A. E. Hunt. No less valuable has been the hearty coöperation of Messrs. Harrington and Norton, who have displayed great zeal and energy in prosecuting the work of testing and arranging the results. In fairness to Messrs. Harrington and Norton, it should be stated that so far as possible the study of the results of the tests has been made independently, and that the tables, plots and conclusions therein presented have been mostly prepared by the writer from the data jointly gathered from the tests, and he understands that not all of these conclusions are shared in by his associates. Their study and conclusions will be embodied in the thesis they propose to submit for the degree of C. E. at Washington University next month.

The credit for the accompanying photographic work is very largely due to Mr. Norton, while to Mr. Harrington is due all of the credit for the very arduous work of integrating all of the areas of the diagrams, which unfortunately have been so disappointing by failing to follow any law.

Foreign Railroad Notes.

Couärd, a French engineer, in the *Revue Générale des Chemins de Fer*, gives an elaborate study of the life of ties. He finds that they last much longer under a light than under a heavy traffic. On a line passed by 18,000 trains yearly, the average life was 8.1 years; on a line with 13,000 trains, 9.7 years, and on a line with only 8,700 trains per year, the life was 11½ years. He found one local road with only 1,760 trains a year, and hence the ties lasted 18.9 years. The influence of climate may make a difference of one-half in the durability. Further, the number of ties per mile has an effect. On a line with 28 per cent. more ties per mile than on another, the ties lasted 37 per cent. longer. They are worn in proportion to the work they have to do; whence Couärd concluded that heavier rails will make the ties last longer. As to grades, he found on double track roads that ties on the down track on the average last only 78 per cent. of the life of ties on the up track, and that the longest life is on the steepest ascents, which he interprets as meaning that the life of ties decreases with the increase of the speed of trains. On some curves, the fastening of some chairs (for double-headed rails) are loosened so often that the resetting of them soon destroys the ties, the life of which is reduced by one-half in these situations. On other curves he found less effect on the ties, yet a reduction of 30 per cent. in their life. Thus he finds the durability of ties affected by a great many elements aside from the kind of wood and its treatment.

The Russian petroleum which, according to some prophets, was going to drive the American product from the European market, has had to call upon the railroads for help to enable it to be exported at all. A rate was made for it in 1889 over the whole length of the Transcaucasian Railroad from the wells at Baku, on the Caspian, to the Black Sea at Batum, amounting to 19 kopeks per pood (=9½ cents per 36 lbs.=26.4 cents per 100 lbs.). At that time petroleum was worth 15 to 20 kopeks per pood in Baku. Now it is worth only from 3¾ to 5 kopeks per pood (about 15 to 19 cents per barrel), and the producers declared that the freight rate must be reduced or they could ship no longer. The railroad is a State road, and it came to the rescue by reducing the freight to 12 kopeks (16⅔ cents per 100 lbs.), and agreed to revise the rates every three months.

Engineering Education.

We gave last week the excellent address of Professor Wood at the first session of the annual meeting of the Society for the Promotion of Engineering Education in Brooklyn, with a programme of papers to be presented. We give now abstracts of a few of the papers and some report of the discussions and of the general business of the meeting.

The following officers were elected for the coming year:

President, G. F. Swain, Mass. Inst. of Technology; Vice-Presidents, R. H. Thurston, Cornell Univ.; F. O. Marvin, Univ. of Kansas; Secretary, J. B. Johnson, Washington Univ.; Treasurer, Storm Bull, Univ. of Wisconsin.

THE EDUCATION OF CIVIL ENGINEERS FOR RAILROAD SERVICE.

By Professor C. Frank Allen, Massachusetts Institute of Technology.

A catalogue of one of the largest technical schools of New England shows that of the graduates engaged in civil engineering 30 per cent. are in railroad work, including presidents and general managers and so on down to supervisors of bridges and buildings. Bridge engineers, as specialists, are not numbered among these. The last list of members of the American Society of Civil Engineers shows that those classified as railroad engineers constitute 20 per cent. of the total or 35 per cent. of the whole number classified. In many cases no occupation is given. Probably as many as 25 per cent. of the total are actually engaged in railroad work.

The facts being as stated, is there sufficient demand for railroad men with civil engineering education, to justify the schools in providing, for those who desire it, instruction intended to prepare them especially for railroad work, and differing from that given to other civil engineering students? In the opinion of the writer there is sufficient demand. It is true, of course, that of those engaged in railroad work at any given date some have been engaged in other civil engineering work, and some will not continue in railroad work. To offset this, there will be a greater demand for young graduates for railroad positions whenever they shall be found better prepared to fill them.

If it be urged that thorough discipline and drill in general civil engineering studies furnish a sufficient foundation, so that the graduate can adapt himself to any special work, it may be answered that the same argument would largely hold in favor of a course of instruction in mathematics not directed towards civil engineering. The discipline and drill is secured even more effectively for civil engineering students, when directed to civil engineering studies specially; similarly, the discipline and drill is amply secured when directed towards railroad engineering, with the advantage of actual preparation for the future. If it appears probable that specialization in this direction would result in a decrease of thoroughness, it should not be attempted. In the schools where the field is already too broad for the teaching force, such specialization would be a mistake.

The education of the engineer for railroad work should be primarily an education in civil engineering, not in mechanical engineering. The important and difficult feature of the railroad is its construction, a critical part of which, for successful operation, is the location, a matter peculiarly within the province of the civil engineer. In fact the location so far influences the difficulty and expense of construction, the cost of operating, and even the possible revenue, that it becomes strictly of primary importance. The value of properly designed rolling stock for railroad use should not be underestimated. Nevertheless, a locomotive of given weight, or for a given service, can be, and in practice very commonly is, designed and constructed by one of the many companies formed especially for that purpose. In a similar fashion, a bridge for given data, very commonly is designed and constructed by one of the various bridge companies. It is not true that a retaining wall can be designed and constructed, a pipe-line located and laid, or a station ground arranged, without ordinarily a careful examination being made of the ground. In fact so many and important are the civil engineering duties, as compared with the mechanical engineering duties, that it seems clear that for railroad work the proper education is essentially that in civil engineering.

In what should this education consist? The first and second divisions of such a course would be common to the usual civil engineering course, and then, third, of co-ordinate branches, physical geography, geology, metallurgy.

Fourth, of what may be considered general railroad subjects, some of these, as location, curves, grades, earthwork, are essential; others, turn-outs, spirals, a brief consideration of track, of train resistance, and of economics of location, may form a part of general engineering training.

Fifth, of subjects specially adapted for railroad work, economic theory of location, station ground, yards, signals, train resistance, brakes and brake resistance, tunnels, track, street railroads, building construction, arrangement of buildings; all are suitable for instruction and discipline, and important for the railroad engineer. In addition to these, railroad management, thermo-dynamics and the locomotive, are subjects to which special reference will be made later.

Of the subjects mentioned as special railroad subjects, the economic theory of location enforces strongly the necessity for the railroad engineer to build economically as well as safely, and to give consideration to the economy of maintenance as well as to economy of construction, together with applications of this principle to railroad location. The introduction of systems of signals, the arrangement of station-grounds and yards, are destined to be of so great importance as to call for special instruction in those subjects. The consideration of tunnels furnishes a very favorable opportunity to call attention to the methods adopted in executing engineering work. The study of train resistance, or of brake and brake resistance, important in itself, offers opportunity for valuable theoretical training. Railroad engineers are called upon to design and construct buildings, and should be able to design and order material for buildings of the ordinary kind; attention should also be called to the arrangement of buildings with a view to economy and convenience for the special duties intended.

While the engineer for railroad work should receive an education primarily as a civil engineer, rather than as a mechanical engineer, yet in the operation of the railroad, questions as to the use of the motive power are of greater importance than is the case in most of the other work controlled by civil engineers. It follows that a thorough training and education as to the properties of steam and its application in the locomotive, would prove very valuable to the railroad operating official. Whether, when the requirements of civil engineering are satisfied in the course, there can be found room for a satisfactory treatment of the subjects, and whether it will be practicable to furnish a limited course in the subjects fitted especially to the wants of railroad civil engineers, may prove a difficult problem, not to be decided in the same way in all schools.

The field for civil engineers in railroad work is not limited to the strictly engineering work. The young engineer usually enters railroad service on the engineering side, but may be called upon to engage in work in other departments. It is convenient to consider the railroad as divided into five great departments: 1, Financial; 2, Construction; 3, Operating; 4, Commercial; 5, Legal.

The financial department is commonly under the immediate control of the president, and frequently the presidents of important systems have been civil engineers, as in the case of the Pennsylvania Railroad. Whether a engineering training furnishes the best education for this department or not, certainly the mathematical training received would be of especial value.

Construction, of course, should be directly in the hands of the civil engineer.

The operating department, under the head of a general manager or superintendent, requires the services of men capable of acquiring a thorough grasp of practical and mechanical details connected with the roadway and equipment, and of the capabilties and defects of each. A technical engineering training furnishes the proper foundation from which practical experience and knowledge of detail can be most correctly and rapidly secured. The operating of railroads has often been in the hands of civil engineers, and may be considered within the lines of civil engineering practice, broadly considered.

The commercial department, dealing especially with railroad rates, properly requires at its head, a man of clear mathematical discernment, and preferably one with a training such that he can appreciate the effect of grade and other peculiarities of location upon the cost of operating, for this, in the case of low-class goods, should form an element in fixing rates. An engineering education is as good a preparation for such duties as can readily be secured.

In preparation for the legal department, the writer strongly urges the claims of the technical school. The successful lawyer to-day is not the gifted orator, but rather that man who with clearness of vision in analyzing his case, selects the point or points upon which success must depend, and upon these points carefully developes his case. The analytical quality of mind necessary, is better developed by the mathematical studies and the investigations required in our best technical schools, than in our colleges where the influence of classical education is still predominant.

If then, an education in civil engineering is a suitable preparation for work in any of these five departments, should an attempt be made to teach such subjects as will educate the student in these other departments as thoroughly as he is now eduated in civil engineering? The answer to this question must now be that the demand is not at present sufficient to warrant taking from engineering studies enough to allow a really efficient preparation for the other departments.

When this is granted, it does not follow that no attempt should be made to prepare or stimulate the student to enter into these other departments of railroad service. The writer recommends at present only a brief course in railroad administration or management, which will acquaint the student with the important features of the railroad, its organization, methods of administration, and the economic questions involved in "the railroad problem;" and which will enable the young engineer to see and appreciate what is going on around him, and, broadened beforehand, to become the all-around efficient railroad man who will be in demand as important positions become vacant. Such a course would lead graduates to accept employment in the financial and commercial departments, or to supplement their engineering studies by a course in the law school. In time the demand would warrant the introduction of special courses for educating young men for general railroad service. The studies mentioned as special railroad subjects would form a suitable course for graduate students who desire to supplement a general course in civil engineering already acquired.

Success in railroad service does not result altogether from engineering skill or ability. Energy, and executive or business ability are elements of at least equal importance. To a large extent these qualities are acquired outside of, and later than the formal education of the student. Yet the course of study laid down by our best engineering schools faithfully carried out does require on the part of the student an energy which is an earnest of future success.

Executive and business ability depend largely upon experience in practical business life. Although not very much can be done in this direction, yet the student can be broadened so that at graduation he shall be something better than a mathematical engineering prodigy. Courses of study distinctly not professional can be introduced to advantage. The study of Business Law is very desirable, and some knowledge of Finance will certainly prove of advantage in Engineering; societies organized and carried on by students, will develop confidence for speaking in public. It should be borne in mind that a clear understanding of the business carried on is a very important element in the successful executive, and in this particular the engineering education performs its proper part.

Finally, engineering education is not the only path to success in railroad service. Promotion from the ranks will always be a means of reaching the highest positions. Nevertheless, there ought to be a demand on the part of the railroads for men with the education which our engineering schools can well provide, and our engineering schools should stand ready to meet this demand, certainly as soon as this can be done without weakening work already undertaken.

ENTRANCE REQUIREMENTS COMMON TO ALL ENGINEERING SCHOOLS.

By F. O. Marvin, Univ. of Kansas.

This paper outlines the present situation in America, as derived from 77 schools and colleges, which he divides into two classes, high and low grade. A careful tabulation shows much variation in requirements, as to subject matter, sequence and relation in single subject to whole. Mathematical subjects show greatest uniformity. Physics and physical geography are required in about one-third of the schools, drawing in 7 only. Much variation occurs in foreign languages, both as to subjects and as to quantity. In discussing standard requirements, he formulates certain governing principles:

1. High schools are natural feeders of engineering schools.
2. No gap should occur between high school and college.
3. College entrance and high school graduation requirements should coincide.
4. High school is primarily for completion of general education, not a fitting school.
5. No difference in method is necessary for the two purposes stated.
6. Engineering requirements should include more science and mathematics, less language than requirements for arts.
7. No engineering admission requirement is unsuited to a high school course.

The author's views as to desirable requirements include physical geography, physiology, botany, physics and chemistry. He strongly urges drawing.

Examinations should be tests of power of student over subjects, not quantity of information. A four years' high school course, with laboratory work, is thought necessary to fully cover the ground desired. Possible four years' and possible three years' courses are tabulated. Engineering professors are urged to exert influence in various ways to the desired end. Classical colleges should not have the field left undisputed.

The discussion was full and interest strong. The importance of the subject was recognized to the extent of appointing a committee of five to report at the next meeting.

TEXT BOOKS CONSIDERED AS SUCH AND NOT AS WORKS OF REFERENCE.

By C. H. Benjamin, Case School of Applied Science.

The Chicago meeting showed a sentiment in favor of using some text book, vitalized generally by lectures or conferences with students. Notes taken by students are found insufficient. Of books written on nearly every subject, few are suited for text books. Overmuch material, badly assorted, is a common fault, as is lack of clearness in style. A common formula in compounding a text book is:

10 per cent principle,
20 per cent. government reports,
20 per cent. irrelevant remarks,
50 per cent. trade catalogues to fill up.
Result, a $5 book.

Text books should be written solely to instruct learners and should be solid with meat. Mathematical parts should be simple as possible. A special case worked, will sometimes explain better than complete treatment. There is good demand for clear, pithy manuals.

The discussion developed considerable interest. A dis-

tinguished writer present regretted that his only text book had the faults described. He had, however, found nothing better on the subject. The necessity for clearness in headings and for a complete index was commented on.

TEACHERS AND TEXT BOOKS IN MATHEMATICS FOR ENGINEERING STUDENTS.

By Mansfield Merriman, Lehigh University.

The opinion expressed by the writer that a good text book made the teacher's most important function to keep order, did not meet with favor in the after discussion. He advocates a revision in the order of teaching mathematical subjects.

Spherical trigonometry, for geodetic students mainly, may come late in course; some parts of algebra the same. Logarithms should not be introduced with trigonometry to confuse student, natural functions being available. A course in computation later in course would include logarithms; standards of precision and adjustment of errors could then apply in connection with appropriate studies. Calculus could be simplified for students by teaching integral with differential; a scheme for classification of integrals was suggested.

In the discussion the novel views presented by the writer met largely with approval; the important exception is noted above.

THE TEACHING OF ENGINEERING SPECIFICATIONS AND THE LAW OF CONTRACTS TO ENGINEERING STUDENTS.

By J. B. Johnson, Washington Univ.

The legal principles of contracts, and good practice in writing specifications, are of importance sufficient to justify the time necessary in a four years' course. Defects in specifications as often cause failure as defects in design. A short course of perhaps 30 hours is sufficient. The greatest lack is a suitable text book. Law books are not suitable for laymen. Law of contracts can be condensed for engineering students into 40 octavo pages. The writer suggests, for a course, or for a text book:

1. Synopsis of law of contracts.
2. List of papers and proceedings complete, including advertisements, proposals, etc., etc.
3. Analysis of general clauses found in contracts.
4. Sample specifications examined and discussed.

Supplementary specifications for various structures might be published in uniform style. Such a course, based on such a book, would justify the time spent.

The discussion showed that in several engineering schools, some instruction in contract law has formed a part of the course.

MECHANICAL DRAWING IN TECHNICAL SCHOOLS.

By J. J. Flather, Purdue University.

Mechanical drawing is taught in all varieties of engineering schools, but often in such fashion as not to give the student the best training for use after graduation. The system of projection often is not in harmony with shop methods. A drawing for shop use should be self-explanatory, not finely finished, but strongly drawn and complete in information. Free-hand drawing is important for mechanical purposes, in sketch drawings for shop use. A course in it should consist in object drawing, then machine sketching; later, dimensions may be taken; memory sketches are useful. Plain, effective lettering is important and can be acquired only by constant practice. Two simple forms only are preferable, and with drill can be mastered. The principles of projection must be rubbed in. He does not believe in geometrical line work at start, but would enter at once upon useful subjects. Shop methods of representation should be taught, and good actual samples exhibited. Practice in drawing continues in descriptive geometry, machine design and other branches where it forms an essential part. In design, calculations are an integral part, and should involve more than substitution of values in formulas.

GRADUATE AND POST-GRADUATE ENGINEERING DEGREES.

By Prof. Palmer C. Ricketts, Director Troy Polytechnic Institute.

A degree, conferred at the conclusion of a prescribed course of study, merely signifies that a course has been finished to the satisfaction of the corporation conferring it. Therefore, it seems appropriate to use those words for the degree, or those letters for its abbreviation, which most nearly indicate the character and object of the curriculum.

It is the general custom for engineering schools in this country to confer the degree of Civil Engineer upon candidates who have satsfactorily finished a course, the object of which is to fit them for the practice of the profession of civil engineering, or the degree of Mechanical Engineer at the conclusion of a course of mechanical engineering. Possibly it may be more logical to confer the degrees of Bacholor of Civil Engineering and Bachelor of Mechanical Engineering, but the first method has prestige derived from age and general usage.

Objections of some strength would evidently have to be advanced to a board which for sixty years had conferred the degree of Civil Engineer before any change would be made. Those known to me do not seem strong.

The argument has been advanced, that since all graduates of such schools do not follow the profession, professional degrees should not be conferred upon any of them until they have had practical experience. I can see no reason in this objection. It matters nothing if some manufacturers, lawyers, or ministers have the right to place C. E. or M. E. after their names. It has also often been said that such degrees should not be conferred upon graduates without experience, because the general public, in some parts of the country, is liable to be misled, and employ them to take charge of work of great magnitude, in place of their more experienced professional brethren, and to the injuryof the profession at large. Experience with the action of the public in relation to young practitioners of the medical profession does not support this assumption. Against the use of the abbreviations C. E. and M. E., there has been advanced the objection that non-graduate civil and mechanical engineers some times use them instead of calling themselves simply civil or mechanical engineers. Probably few reputable engineers of any prominence err in this respect. The disreputable ones can do as they please and without much injury to the profession.

As a matter of fact, the whole subject is of minor importance; as long as institutions hardly above the grade of preparatory schools confer engineering degrees, it is of small use to discuss what the degree should be. The course, not the degree, is of value, and employers in want of a young graduate ask, "What course did he take and in what school?" and "What kind of a man is he"? and not, "What degree does he have"? Later, they are concerned only about his experience, and even the school becomes of small importance.

No reason appears for conferring the degree of Bachelor of Science at the conclusion of the course intended to lead to the practice of any branch of engineering, no matter how elementary such a course may be. Master of Engineering is perhaps as good as any post-graduate engineering degree. No one would have the right. to assume that such a degree meant anything else than that its recipient had taken a prescribed course of study, and its abbreviation likewise would probably be displaced by those of recognized engineering societies.

By Prof. George F. Swain, Mass. Inst. of Technology.

A college diploma is nothing more than a certificate of work done; it is not a certificate of character. Neither is it a guarantee that the holder is qualified to at once do responsible work in his profession. Nor is it a recommendation from the institution conferring it. An institution of learning is occasionally obliged to award its diploma to men whom the members of the faculty might not personally feel able to recommend. In considering a candidate for graduation the personal opinion of his instructors must frequently be the final criterion. Nevertheless, an institution is likely at any time to graduate a man because he has technically performed the work required and from whom the faculty cannot consistently withhold the diploma, although as individuals they might be unwilling to recommend him to an engineer for an assistant.

If it is true, then, that a collegiate degree simply stands for certain academic work done and is not a recommendation or a certificate of character, the form of degree conferred should by its name indicate its true meaning, and show it to be an academic degree and not indicate the name of a profession or occupation.

The degrees in common use belong to three classes. In the first class belong degrees similar to the degrees of A. B., A. M., Ph. D., M. D. For engineering or scientific schools, the corresponding and strictly analogous degrees would be S. B. or B. S., Ph. D., S. D. These titles or degrees have no meaning except as academic degrees.

In the second class stand the degrees which may be called descriptive degrees, of recent origin, and conferred principally, if not exclusively, in this country. These are simple abbreviations of the name of the profession or occupation for which the recipient is supposed to be prepared: C. E., Civil Engineer; M. E., Mechanical Engineer, or Mining Engineer; D E., Dynamical Engineer; E. E., Electrical Engineer; S. E., Sanitary Engineer; and probably others. Degrees of this kind seem less suitable as representing academic work done than degrees of the first class. The reasons for this are four in number.

First, the descriptive technical degrees are not in line with, and do not correspond to the ordinary academic degrees, and it is preferable that collegiate degrees of all classes should be chosen according to some uniform system. The distinction, however, between the ordinary classical degree of A. B. and scientific degree of S. B., is plain and obvious.

Second, these degrees are simple names, or abbreviations of the names, of occupations or professions, and their use leads to confusion, especially in schools where the number of courses is large. If a graduate in Civil Engineering receives the degree C. E., the graduate in Electrical Engineering the degree E. E., what degree shall the graduate in Architecture receive, or the graduate in Chemistry? It would be just as consistent and reasonable to use for the degree in Architecture the simple letter A., and in Chemistry the simple letter C.

Third, the descriptive degree is liable to abuse. Plumbers are nowadays blossoming out into sanitary engineers in great luxuriance. Many a practicing civil engineer, entitled by his attainments to call himself one, and even eminent in his profession, finds it desirable to abbreviate and to write C. E. after his name. Moreover, the temptation is great, to one who is unscrupulous but pushing, to assume this title as a deliberate means of deception, under the pretext of using a simple abbreviation.

Fourth, a further objection is that in reality a school training does not make a man an engineer. To confer upon him, therefore, the degree of C. E. or M. E., is in itself a contradiction in terms. In order to become an engineer, much more is needed than the training given in any institution. Experience and judgment are needed as well as knowledge, and these can be taught only to a very limited degree in a school.

In the third class, and intermediate between the simple degrees S. B. or Ph. B., and the purely descriptive degrees C. E., etc., are the degrees such as B. C. E., B. M., E., etc., which are awarded at several schools. A good deal may be said in favor of degrees of this kind, and not much against them. Their name indicates them to be academic degrees; they are not simply the names of professions or occupations, they are in line with the old established classical degrees, and are not liable to abuse. Difficulty or confusion results when the number of courses is large. The difficulty in a case of Architecture and Chemistry still exists. It seems inadvisable to confer a large variety of degrees. The degrees S. B., Ph. B., are simple and general in character; they indicate that the training in engineering courses lies in the scientific principles which underlie and are essential to the work of the engineer, although the profession itself may be considered a practical profession, as is shown by the cases in which engineers have attained great eminence with little or no knowledge of mechanics or mathematics. The training of the engineering schools being largely a training in science, there is propriety in a degree which emphasizes this fact.

For the undergraduate degree, S. B. or B. S. is preferred; for advanced degrees, correspondingly, M. S. or D. S.; if an additional or higher degree is desired, that of Ph. D. appears the broadest and most suitable. The point most strongly urged, however, is that the so-called purely descriptive degrees like C. E., M. E., when awarded for academic work, are misleading and unsuitable.

It does not seem, however, that the matter of engineering degrees is one of such supreme importance as it is by some considered: for the reason already stated, that an engineer in practice very soon comes to stand upon his own acquired reputation, and is judged with reference to his character, his experience, and the record he has made, frequently without any reference to his academic degree, if he has one.

By Prof. R. H. Thurston, Cornell University.

The writer was compelled to decide this question for himself as long ago as 1871, in connection with the establishment of a course of instruction in mechanical engineering, as distinctive in its field as that offered at the Renssalaer Polytechnic in civil engineering. A careful discussion of the subject with the best known and most competent members of the profession, confirmed his own impressions, and led to the selection of the professional title rather than that of the older class of schools and colleges. The reasons for the final decision were simple and easily summarized.

The school was intended to be a professional school. It was important that the degree offered should indicate that fact and give some presumption that the graduates might be expected to exhibit some special fitness for that profession. It was desirable that neither the school, course nor the graduate should be confounded with those so nearly universally recognized as below the standard set by the profession, and which, organized in connection with the older institutions of learning, controlled by non-professionals, by the clergy largely, and offering singularly inadequate courses of instruction, graduated students neither educated nor professionally trained, and usually compelled to unlearn much of their "professional" instruction before they could be entrusted with any really useful office or field work.

For the hybrid courses of the older regime, the older designation was recognized as appropriate. The schools were not, properly speaking, professional; but were schools of applied science. With them "Bachelor of Science" was as appropriate for a title as for the schools of pure science beside them.

It was thought that the professional title would prove more acceptable for the distinctively professional school, both as more appropriate in view of the character of the school, its greater likeness to the other professional schools, as of law and medicine, and as more likely to satisfy the student and the alumnus, a matter in itself of some importance. It was also thought that the old Latin term, Bachelor, was hardly consonant with modern and popular ideas; "Bachelor of Science in Engineering" was not so bad; but "Bachelor of Engineering" seemed inadmissable. For the second degree the good old English term "Master" awakened no opposition, and a "Doctorate in Engineering" was admitted.

The writer, personally, and he thinks with the majority of the abler members of the profession, settled upon the use of the title of the profession for a first degree, a Master's degree for a second, and the Doctorate for the highest degree proposed. The term "Bachelor" was thought inappropriate.

On the establishment of the course offered in 1871 at the Stevens Institute of Technology, the undergraduate course led to the degree "Mechanical Engineer;" the advanced courses were left to be established later. The honorary degree of Doctor was in a few instances conferred.

When the writer was transferred to Sibley College, Cornell University, in 1885, in organizing its courses a scheme similar to that adopted at Hoboken was advocated. The same titles for the first and second de-

(*Concluded on page 598.*)

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

We are interested to notice in the report of Mr. Egan's testimony before the National Strike Commission now sitting at Chicago, the following:

Mr. Egan thought as a solution of the railroad problem that licenses should be issued by the United States to employees. He wanted these employees uniformed. He thought both employees and railroads would be benefited by this plan. The railroads should also insure their men, and at the end of a certain time pay over to them their money with interest. A heavy penalty should be imposed on railroads if they broke their agreement, and in case of employees doing so they should forfeit their licenses. "How would you fix a scale of wages?" "I would have the employees of each railroad meet with the officers and fix a schedule of wages. I think there would be no trouble in doing this." Mr. Egan thought the cause of strikes was the agitation of labor leaders rather than any real grievances. He admitted that in some cases the men have grievances.

This opens up several topics for interminable talk, but we will spare the reader, having no pet plan for preventing strikes, and being still pretty well satisfied that what we want is not new laws or new systems, but prompt enforcement of existing laws; that is, a more intelligent public opinion. When we see the fourth state in the Union governed by an anarchist, and the second city governed by a demagogue, who will both help any attack on any corporation just so far as they dare, all specific plans seem not only insignificant but almost hopeless. But it has long been obvious that in pretty nearly every railroad strike (perhaps we might say every late one) there is a sufficient number of level-headed and plucky men to keep the road open, if they could feel sure of even a pretence of protection, and if they were braced up by the sense of being part of a coherent body. Perhaps a plan of licensing, as suggested by Mr. Egan, or of enlistment, as suggested by Mr. Archimedes Stephenson Watt in our issue of August 3, might be worked out so that these men would volunteer to go into it. Let us have the definite lines of the plans.

The anti-pass movement in the State of New York has actually made some progress. Last Friday the Constitutional Convention adopted and ordered to third reading the following proposed amendment to the constitution:

No public officer or person elected or appointed to a public office under the laws of this State shall directly or indirectly ask, demand, accept, receive, or consent to receive for his own use and benefit, or for the use and benefit of another, any free pass, free transportation, franking privilege or discrimination in passenger, telegraph or telephone rates from any person or corporation, or shall make use of the same either by himself or in connection with another. Any person who violates any provision of this Act shall be deemed guilty of a misdemeanor and shall forfeit his office at the suit of the Attorney General.

President Choate suggested that the giver of a pass should also be made guilty of a misdemeanor; but finally withdrew this suggestion in the hope that at least half a loaf could be got out of the movement. Some efforts were made to ridicule the amendment down. One man moved to provide that the informer succeed the officer removed for this offence, and the president of the State Liquor Dealers' Association moved to include the anti-treating scheme. A resolution was offered providing that any delegate to the convention found riding on a pass lose his pay for the rest of the session. The civic zeal and heroism of the delegates petered out at this, and the resolution was promptly tabled. They were willing to send all their wives' relations to war, but thought that they could serve their country better by staying at home themselves, and keeping the show going. But it really looks as if the newspapers might now push this matter to a useful conclusion in the State of New York at least.

For the month of August the gross earnings of a good many roads ought to show a decided increase, if we may judge by the reports of brisk business. On August 22 the Pensylvania road handled 5,600 cars between Altoona and Harrisburg, the largest freight movement ever recorded on the division. Freight business in Western Pennsylvania has been very active for several weeks and the Pittsburg, Fort Wayne & Chicago moved more freight in the week ending August 18 than ever before in the same time. The reporter of the Pittsburg *Post* finds a similar condition of things on the other roads entering that city. The Lake Shore & Michigan Southern and the Pittsburg & Lake Erie have been short of cars for two or three weeks; especially coal cars. The Erie is reported to be doing a heavy eastbound business. This and other indications show that coal and iron are not the only commodities in which there is a rush. A St. Louis paper publishes the following statement of loaded cars received and forwarded at St. Louis for the periods mentioned, this year and last:

Week.	Cars. 1894.	Cars. 1893.
July 21	25,193	24,458
July 28	25,981	25,651
August 4	28,185	26,953
August 11	26,246	25,961

The activity is not all in freight. Passenger traffic managers are stimulated by the low earnings of their companies to run as many excursions as possible and the public seems to respond very freely. It has been said that this good patronage is because all these people went to the World's Fair last year and so are unusually desirous of seeing their accustomed coast or mountain resorts this year. Whether this is the fact, or the present low-priced excursions are made up of people who have in other years taken more expensive trips, we cannot say,

We noted two weeks ago the activity of the Pennsylvania road in the excursion business. A recent number of a Rochester paper mentioned a half-dozen different excursions on the New York Central. A Denver paper reports that the excursion business on the Denver & Rio Grande has been heavy for six weeks. The activity of the Chicago roads has been reported in our traffic columns. Evidently the passenger cars built for the World's Fair are not to stand idle if low prices will fill them. How much of this freight and passenger traffic will help the *net* earnings is another story.

The Catechism on the Standard Code of Train Rules, which was prepared by a committee of the American Society of Railroad Superintendents two years ago, has just been issued in pamphlet form by Secretary Hammond. This is the best catechism on this subject that has ever been made, and this pamphlet will be a cconvenient hand-book, not only for railroad officers who have no catechism of their own, but for those who have as well; for no catechism of train-rule questions yet made has been anywhere near perfect, and any superintendent or trainmaster who has catechising to do can get points by comparing questions framed by different persons. Those who remember the very instructive remarks made by Major Huger, the chairman of the committee, when he reported this work at the meeting in 1892, will fully appreciate this. (The matter is fully reported in the proceedings of the Twenty-first meeting of the society.) And if anyone thinks that a half-day session is sufficient to test a dozen men on the rules a perusal of the report of this meeting will convince him to the contray. A single question on each rule would require at least that much time, and some of the rules call for several questions each. There being such a large number of rules, the need of having every question phrased in the best form, so as to present itself to the man examined in the most effective way, is at once apparent. Another thing which appears clearly from reading this catechism and from the discussion at the meeting referred to, is that questioning a man on a part of the rules does not test him on the whole. It is, indeed, easy to judge of a man's general intelligence and to form some idea of the value of his experience, from a very few questions on selected rules; and for new men, in the lower grades, this is often sufficient, at least for the first examination. But a complete examination contemplates difficulties among the rules in the back part of the book as well as with those in the front; and the clearing up of points on which intelligent conductors and enginemen differ. And finally an examination is largely for the purpose of "brushing up" the minds of all the men, good and otherwise, on points at which they do not differ, but which they have not given much thought to. Therefore, every means, such as this catechism, which will help to make examinations more complete and systematic is to be welcomed.

To Prevent the Plundering of Railroads.

We may start out with the proposition that private ownership of railroads is the true policy for any normal country, and the policy which is bound to prevail, in all English speaking countries, at any rate. Then it must be a fundamentally sound proposition that the best and indeed the only safe regulation of railroads must be such as will secure the control of the property by its owners and make them responsible for the results. No doctrine is more pernicious than that the government is a sort of nurse for the feeble, or guardian for the lazy and irresponsible. No government can possibly be wise enough to perform such functions. It has been tried a great many times and has always failed sooner or later, mostly sooner. We may therefore measure the bill introduced into Congress by Senator Cullom and by Representative Straus by these principles. An abstract of the bill is printed on another page, and for brevity we shall speak of it as the Rice bill, for reasons that will appear to one who cares to read the abstract.

The purpose of this bill is avowedly to prevent fraud in high places, to keep officers, directors and receivers from swindling the actual owners of the railroads and from preying upon that part of the public which has money to invest. It has no other purpose. It is not designed to limit the honest and useful enterprises of corporations, but rather to stimulate such enterprises by making them safer for the investor. The purpose of the bill is, then, admirable. It is right in line with the fundamental purposes of all social organization, and it aims to do what has been pretty well done for the last 40 or 50 years by what is essentially the freest civilized nation on earth. Every patriotic citizen ought to vote for a law that will make our credit better at home and abroad, that will make life easier for honest men and harder for rogues, and that will tempt the prudent investor to put his savings into a field that seems in a good deal of danger of being left to the most hardened and daring speculators.

Such is the purpose of the bill, and in the main it seems to be well contrived to secure such ends; but the machinery by which it is proposed to prevent fraud in accounting and in financial reports and to prevent the plunder of railroad properties by speculative rascals who have got into the directory appears to us seriously defective. It is proposeed that the Interstate Commerce Commission shall appoint United States railroad examiners, and to provide the examiners with all necessry powers to enable them to scrutinize all the affairs of the railroad companies. In other words, it is proposed to create a set of government inquisitors, endowed with powers to investigate private rights and doings; and such a set of inquisitors would be odious to most of us. It is said that railroads have ceased to be private enterprises. On the contrary, they are strictly private enterprises, performiag certain public functions, and with certain public obligations. The analogy between these railroad examiners and the national bank examiners is more apparent than real. The United States Government undertakes to guarantee, to a certain extent, the financial security of the national banks, and it is necessary that it should have such control over those banks and over their accounts as will enable it to know that the operations of any one bank do not imperil the margin which that bank has put up with the Treasury. The Government has no such responsibility towards the railroads and we trust will never be called upon to assume it. Such an inquisition as it is proposed to establish by this corps of examiners is not only repugnant to our whole national spirit but it is uncalled for and dangerous. Fancy the government, through a set of $1,200 or $2,000 clerks, trying to control the credit of the greatest class of corporations in the world!

The demand for an examination into the accounts and financial affairs of a property should originate with the owners of the property and not with a paternal government which undertakes to keep peo-

ple from confiding themselves to swindlers. It should be a private business transaction. Ample provision has been made for such examination, by the English railroad laws, for the last 50 years. Under the act of 1845 two auditors are elected by the stockholders at their first ordinary meeting and after this one auditor is elected every year, one of the old ones retiring. These auditors were originally stockholders, but by the act of 1868 others than stockholders were made eligible to election as auditors. These auditors are authorized to employ accountants or other examiners, as they think proper, and at the expense of the company, and it is their duty to examine the periodical accounts and balance sheets. If accounts are falsified, the responsible person, that is, the person who signs the document, be he director, accountant or auditor, is liable to fine and imprisonment. Furthermore, the Board of Trade has the power to appoint one or more inspectors upon application of the directors, or of two-fifths of the ordinary stock, or one-half of the mortgage debt, or two-fifths of the guaranteed or preference stock. The cost of the examination to be made by such inspectors must be borne by the people asking for the examination, and the Board of Trade may require the applicants to give security for such costs. These auditors and inspectors, whether elected by the company or appointed by the Board of Trade, have ample powers. The Board of Trade may direct the cost or any portion of the cost of an examination of accounts to be borne by the company. Further, the Board of Trade may, upon application of the directors, or of the company, appoint an auditor in addition to the auditors of the company, with the same duties and power as the elected auditors.

It will be observed that this plan differs fundamentally from the one proposed in the Rice bill in a vital feature, which is that the scrutiny of the accounts of the company originates with the owners of the property. It remains a part of their private business, and the responsibility of looking out for their own property still rests upon them and is not made a part of the duty of any government.

But in order that the owners of the property may exercise any control over it, either through auditors and inspectors or in any other way, it must be possible for them to elect officers who will carry out the will of the majority and to prevent the election of officers who will not; that is, actual control over their property must be possible, and this brings us to the second feature of the Rice bill, and the one which seems to us the most important, the provision for honest elections. This, is possibly, on the whole, adequate and not fundamentally erroneous. But there is one particular in this provision that seems to be a mistake. Voting trusts are made illegal. Now voting trusts are already strictly illegal; but the contrivances by which owners of stock surrender for a time their right to vote and which we may, "for short" call "voting trusts" are an important and oftentimes an essential element of the reorganization of a property. It becomes necessary to invest new capital; but that new capital cannot be got unless those who invest it can be sure that, for a time at least, their representatives will control the policy of the company; and the voting trust scheme does not necessarily invade any of the rights of the old owners of the property. These owners have the misfortune to have a discredited property, and for the sake of rehabilitating it they voluntarily put out of their own hands the control of that property for a certain time, as one of the conditions by which they can get other people to help them out of their trouble. It is simply a part of the bargain which they make. Voting trusts may be perverted to base uses and thus they may be very bad; but that is not because they are bad in principle, but because a good instrument is badly used. Such a contingency it is impossible for any law, however ingeniously framed, to entirely guard against.

The restrictions in the appointment of receivers seem judicious, and so do all the provisions against speculation in the securities of the company by its responsible officers, and against such officers making contracts with themselves as representatives of the company. This last provision seems unnecessary, for it must be covered by the common law and the statutes of the states, and yet the practice is so frequent and so pernicious that it is probably well to include such a clause in the new act.

With the light before us we object strongly to the government examiners and to the abolition of the voting trust; otherwise the bill appears to be a good one and the reform at which it aims is vital. It must be brought about in some way if our credit is not to be wrecked. With the exceptions that we have named, the proposed law would help matters, if it could be enforced. The plan of making, by law, shareholders vote and preventing voting by any but *bona fide* stockholders is not new; but it does not seem to have succeeded very well in the past.

But we are disposed to think that there is a simpler and surer way of accomplishing the purposes of this bill. That is by making the directors trustees instead of agents. Make them responsible for their conduct of the properties entrusted to their care just as trustees and executors are responsible. They would then have a very lively interest in keeping matters straight.

The Railroads and the Tramps.

It is gratifying to be able to note that the recent action of the Pennsylvania road in driving tramps off from its trains and premises so as to reduce the death record, has been quickly successful. As mentioned in the *Railroad Gazette* two weeks ago (page 549), the slaughter of trespassers had become very serious —even if we take no higher ground than that of the fireman, who agreed with the young lady that it was dreadful to run over a man because it mussed up the engine so—and although the legal status of the matter had not changed in the least, the officers of the road decided to spur the officers of the law to a little more activity, and we are informed that the list of casualities has already been diminished very greatly. We note this fact more particularly as an encouragement to other superintendents, who have similar trouble and who find it rooted in similar causes, the inability or indisposition of municipal authorities to enforce the laws against vagrancy; but we are compelled to say that the railroad had to bear the brunt of the fight.

The division superintendents provided special officers at terminal points and at other places where they were most likely to be needed, and issued orders so that these, acting in conjunction with freight conductors and others, got the tramps before the magistrates wherever necessay. By publishing the facts of the suituation the aid of the local newspapers along the road was enlisted so that, for the time being at least, public sentiment was decided. Tramps can detect a change in public sentiment as well as politicians, often quicker, and their realization of what was in the air is doubless one reason why the officers of the Pennsylvania are now finding fewer of them to deal with. But they will be equally quick to notice any reaction on the part of the conductors and the police; and it is, therefore, to be hoped that this action of the railroad company will arouse the local constables and magistrates to a better sense of the constant duty that rests upon them.

Coxeyism, though a temporary malady, seems likely to result in aggravating the tramp nuisance for a long time. Like potato bugs and English sparrows it is an evil which has arisen quickly, but which can be exterminated only at prodigious pains. The "bums" have learned how easy it is to congregate in fifties instead of dozens, and how lenient the public is likely to be with them, and such minor crimes as robbing freight crews of their watches and pocket books are likely to be more frequent in the future than in the past, and now we begin to hear of their robbing passengers. The only remedy, of course, is the same that has always been available, enforce the vagrant laws as rigidly as possible, and we hope this example will be widely followed. Various roads have, indeed, taken similar action before, but the distinctive merit of the Pennsylvania's action was in making the attacks systematically and simultaneously all along the road, from Pittsburg to Philadelphia.

There is one point which every magistrate ought to appreciate and which we hope the attention of every such officer will be called to, and that is the superior efficacy, as a protection to the public, of action taken by the local authorities on their own motion. Nothing is more common, as an explanation of a malicious derailment, than the statement that a tramp did it from revenge against the railroad company; but if ever the town and city authorities can be aroused to the duty of dispersing or jailing tramps on general principles—that is, primarily for the protection of the entire public and not for the (apparent) convenience of railroad officers—the tramps will probably be decoyed into a more rational attitude of mind; one in which they will direct their hate in its normal direction, against the whole public and not against railroad companies and their passengers particularly.

July Accidents.

Our record of train accidents in July given in this number includes 61 collisions, 75 derailments and 12 other accidents, a total of 148 accidents, in which 64 persons were killed and 150 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported, make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	Butting.	Cross- and other.	Total.
Trains breaking in two	7	0	0	7
Misplaced switch	4	1	3	8
Failure to give or observe signal	3	0	0	3
Mistake in giving or understanding orders	0	4	0	4
Miscellaneous	9	4	5	18
Unexplained	4	6	11	21
Total	27	15	19	61

DERAILMENTS:			
Broken rail	2	Failure to observe signal	2
Loose or spread rail	2	Runaway train	1
Defective bridge	2	Animals on track	3
Broken wheel	5	Landslide	1
Broken axle	9	Maliciously misplaced switch	7
Broken truck	2	Malicious obstruction	7
Broken car	1	Accidental obstruction	3
Fallen brakebeam	1	Unexplained	14
Failure of drawbar	3	Total	75
Dropped on track	1		
Misplaced switch	8		
Bad switching	1		

OTHER ACCIDENTS:		
Explosion	1	
Waterspout	1	
Dynamite	5	
Broken side rod	1	
Cars burned while running	2	
Other causes	2	
		12
Total number of accidents		148

A general classification shows:

	Collisions.	Derailments.	Other ac'd'ts.	Total.	p.c.
Defects of road	0	6	0	6	4
Defects of equipment	7	22	1	30	20
Negligence in operating	33	12	3	48	33
Unforeseen obstructions	0	21	8	29	20
Unexplained	21	14	0	35	23
Total	61	75	12	148	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other ac'd'ts.	Total.
Passenger	30	22	8	60
Freight and other	83	54	4	141
Total	113	76	12	201

The casualties may be divided as follows:

KILLED:	Collisions.	Derailments.	Other ac'd'ts.	Total.
Employees	22	20	1	43
Passengers	0	7	0	7
Others	7	7	0	14
Total	29	34	1	64
INJURED:				
Employees	38	48	9	95
Passengers	20	21	1	42
Others	5	8	0	13
Total	63	77	10	150

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road	0	0	2	6
Defects of equipment	1	6	2	11
Negligence in operating	0	20	28	48
Unforeseen obstructions and maliciousness	5	12	10	26
Unexplained	1	4	1	4
Total	7	42	43	95

Thirty-six accidents caused the death of one or more persons each, and 38 caused injury but not death, leaving 74 (50) per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with July of the previous five years shows:

	1894.	1893.	1892.	1891.	1890.	1889.
Collisions	61	89	83	73	84	72
Derailments	75	87	104	91	59	68
Other accidents	12	5	5	5	6	3
Total "	148	181	192	169	149	143
Employees killed	43	36	29	29	47	29
Others "	21	22	16	68	23	13
Employees injured	95	79	77	91	116	73
Others "	55	97	73	121	133	79
Passenger trains involved	60	55	82	67	64	60
Average per day:						
Accidents	4.77	5.84	6.19	5.45	4.81	4.61
Killed	2.06	1.87	1.45	2.97	2.26	1.26
Injured	4.56	5.68	4.84	6.84	8.03	4.74
Average per accident:						
Killed	0.432	0.320	0.234	0.544	0.469	0.213
Injured	1.013	0.972	0.781	1.254	1.672	1.028

The season of light accident records has come to an end, and for July we have to report more persons killed than in the same month of last year. The number of passengers killed, however, is but seven, as compared with ten last year, the list of fatalities being swelled, as it has been for several months, by the killing of a good many persons stealing rides. No less than fourteen "others" were killed in the accidents now reported, and nearly all of these were trespassers. Several of the victims were policemen or other persons engaged on railroad premises in maintaining order. The killing of these policemen is in a sense only an incident of the widespread disturbances due to the strike, with which our readers are familiar, but the record of damages and casualties due directly to these disturbances is quite large and makes the list of accidents more varied than it has been for a long time. A half dozen or more cases are reported as caused by malicious attempts to wreck trains. Five accidents, most of them not very serious, are reported as caused by explosions of dynamite, placed

on the track by unknown persons at various points in the regions affected by strikes.

The principal malicious derailments were those near Battle Creek, Mich., on the 16th, and at Fontanet, Ind., on the 12th. It is possible that in some of the cases of misplaced switches the evidence that the switch had not been negligently left wrong by employees is not conclusive, but we have endeavored to give the strikers the benefit of the doubt in cases of this kind. Of the seven passengers killed in July three were soldiers in the train wrecked near Sacramento, Cal., at the height of the strike excitement there, and two were in the derailment at Moosehead, Me., which accident, according to the latest report, was, without doubt, due to a malicious obstruction. The passenger killed at Valpin, Ind., was on the car platform when the train ran off the track, and jumped off.

The most fatal accident of the month was the butting collision near Atlanta, Tex., on the 23d. Though this was a collision of passenger trains running at high speed, and eight persons were killed, not one of the victims was a passenger, and only one passenger was injured, a circumstance which shows in a striking manner the safety of persons in passenger cars as compared with the condition of those on or about any other part of the train. Three men were killed and ten injured by a bad butting collision at Griffith's, Ind., on the 23d. This collision was due to the forgetfulness of an engineman running without a conductor. It seems to be inevitable that lapses of this kind shall occur now and then; and yet we continue to run engines without a conductor, and to neglect the training of firemen. Probably most superintendents fail to appreciate, unless their attention is specially drawn to the circumstance by an accident like this, how often the presence of an intelligent fireman, well acquainted with the road and the rules, is instrumental in preventing a disastrous mistake by the engineman. In the nature of the cause, this element of safety cannot be estimated with precision, but it is of material importance; and yet on many roads, probably most, the system remains unchanged, whereby a very green fireman may be sent out on a very important train, any day, when there is some little emergency and no one is censured for it.

A fatal collision near Philadelphia on the 10th, in consequence of the turning of a derailing switch at the wrong moment by an excited signalman, and there was one other accident at a derailer. The great danger involved in using M. C. B. draw-bars attached by tail bolts was illustrated in the very bad wreck at Carrollton, N. Y. on the 29th.

A number of persons were injured by a collision of electric street cars in Providence, R. I., on the 29th, and a similar accident occurred in Paterson, N. J., on the 28th. In Revere, Mass., on the 18th two persons were injured by the derailment of an electric street car, which ran too fast around a sharp curve. Near Chester, Pa., on the 19th an electric car ran into a freight train, and the motor man was injured.

Keeping Records of Accidents to Rolling Stock.

Every one who is interested in designing railroad rolling stock and keeping it in serviceable condition understands the advantage of keeping complete records of all failures of, or accidents to, motive power and car equipment. We have shown at intervals various methods employed to keep records of broken stay bolts and their parts; recently our attention has been called to a very complete system of keeping records of all failures or accidents to cars and locomotives, which is followed by Mr. W.S. Morris, Superintendent of Motive Power of the Chesapeake & Ohio.

The foundation of Mr. Morris's system is a thorough examination of every accident or failure. The papers bearing on each individual case are sent to Richmond, where a draughtsman goes over them, selects the essential points and arranges them on a standard size tracing, giving, where possible, a sketch of the part that failed and indicating the location of the failure. The estimated cost of each casualty is also given. The size of the sheets are 8x10 inches, with a ¼-inch border all around and one side left for binding. A number of prints are made from the tracing, and these are distributed to those who are entitled to them; if the part that fails was purchased, a print is also sent to the firm that supplied it.

At the end of each quarter the prints are assembled and bound, records of casualties on the eastern and western divisions being bound separately. In the front of each volume are two indices, one for accidents to locomotives and the other for cars. Each index is arranged with a column for the name of the defective part, then a column for each division of road, and in these columns is given the number of accidents to the particular part mentioned. There is also a column for totals of accidents of a similar nature occurring on all divisions to each defective part, a column for estimated cost and the last column giving the number of the page on which the records will be found. At the bottom of the page is given the total of accidents on each division and the total estimate of cost of all accidents. With such a tabulation of failures, any point particularly weak in design or in amount of material used, will be quickly detected and means adopted to strengthen the part or to relieve the strain.

The method of keeping similar records on the Chicago, Burlington & Quincy Railroad differs somewhat from that used on the Chesapeake & Ohio. Separate sheets, each devoted to accidents to similar parts, are used, and by this means accidents to each particular part of a car or locomotive are assembled on the same sheet.

In this connection it may be remarked that the policy followed by the Chesapeake & Ohio in laying up its locomotives during the period of light traffic is quite in contrast to that followed by railroads generally. All the locomotives that have been withdrawn from service have been put in first-class repair before being stored and this policy is being adhered to. A more common practice is to do only such repair work as is absolutely necessary to keep the few trains running, and this results in shop tracks being crowded with locomotives in bad order and an overcrowding of repair work as traffic increases.

In our issue of August 17 we published a few general statistics of the United States railroads, drawn from the introduction to Poor's "Manual." The preliminary sheets of the statistical report of the Interstate Commerce Commission are just received. This report makes the total railroad mileage at the end of June, 1893, 176,461, being 1,300 miles less than Poor reported for the end of December of the same year. The statistician reports one mile of yard and side track to every 4.2 miles of main line. The total locomotives reported for the United States are 34,788, being 1,200 less than Poor reports and 1,652 more than in 1892. Of these locomotives 27,660 are equipped with air-brake apparatus. The cars equipped with continuous brakes number 271,367, an increase of nearly 40,000 in the year. About 35,000 of the increase were freight cars. The total cars equipped with automatic couplers are 322,238, an increase of nearly 78,000. Of the equipment fitted with air-brakes the Westinghouse cars reported amount to 287,703, the New York 7,133, the Eames vacuum 1,072. No other kind of brake reaches one thousand cars. In couplers the Janney has 102,056, the Gould 59,774. No other company has as many as 18,000, but nearly 41,000 cars are reported as being equipped with "M. C. B." couplers, the special design not named. The total employees were 873,602, or 515 per hundred miles of line. This is an increase of 9 per hundred miles over the former year. We are gratified to find that the number of passengers killed during the year was less by 77 than in the previous year. The number injured was two more; but 173 more employees were killed. The report contains a good many other valuable statistics which we shall not attempt to summarize now.

The blue book, giving the results of the working of the English railroads for 1893 has just come to hand, and shows that the year was a bad one for the owners of the properties. In the proportion of net earnings to capital it was the worst year on record. The mileage increased 321 miles, being 1.58 per cent. The addition to paid-up capital was 2.85 per cent., making the cost per mile of line open £47,047. Nearly £10,000,000 of the increased capital was nominal, being due to conversions or consolidations, and the actual increase was a little more than £17,000,000, or 1.8 per cent. The receipts from passengers increased 0.52 per cent.; the receipts from goods fell off 4.37 per cent. The miscellaneous receipts increased 6.31 per cent., the sum being a decrease of 1.78. The decrease in net revenue was 3.95 per cent., and the proportion of net revenue to capital was 3.6 per cent. The decrease in freight earnings was important in general merchandise, but much more important in minerals, due to the great coal strike. The receipts from third-class passengers increased, while those from first and second both decreased, which has been the history for a good many years.

Engineering Education.

(*Concluded from page 595.*)

grees were adopted. The Doctorate has not yet been established. Many students are now working for the second degree, and the third may be established for a three-years' course *in absentia*, or two-years if in the college and under faculty direction. The growth of the institution is attributed in part to the degrees conferred, but of this no proof existed; there were other conspiring causes.

There are various objections urged against this system of nomenclature for degrees; some of which undoubtedly have weight, some of which are as unquestionably farcical. The objection most commonly and most seriously urged, perhaps, is the undesirability of conferring a degree which is at the same time the designation of the profession itself. This seems to the writer an argument for, rather than against, the title chosen.

Perhaps the most potent argument in favor of the adoption and retention of the special title is the fact that a very large proportion of the graduates of engineering schools, and an increasing proportion, are carrying that title.

Another important consideration is the fact that the recipients of the degrees given prefer the professional title. When, some years ago, the title at Cornell was changed from "Bachelor" to "Civil" and "Mechanical Engineer," it was provided that for the time either title might be received, at the option of the graduate, in electrical engineering courses; not one graduate out of scores taking that course of study ever called for the degree of "Bachelor of Science;" all preferred the degree giving professional distinction, precisely as in other professional schools. That provision still stands, but has completely dropped out of sight through non-application.

The question of the designation of the degree conferred is, after all, a small matter beside the problem which is involved in the construction of a suitable professional course of instruction for the real professional school. By real professional school is here meant an engineering school in which the work is purely that of professional instruction and training, precisely as in any real professional school of law, or of medicine, and in which no working time is sacrificed to general education, to "culture," or to purely gymnastic studies.

The discussion showed that the "descriptive," or "professional" degree was not without friends. Professor Bull suggested that under Professor Thurston's classification no American schools could properly now confer the professional degree, and that the foreign schools gave no degree, but granted a certificate of graduation, a system possibly superior to all others.

Another speaker, referring to the argument that graduates preferred the professional degree, suggested that giving this degree tended to intensify the objection to engineering graduates "that they knew it all," and was, therefore, not for their good, and that the growth of Professor Thurston's classes was due to his good work and not any tag attached.

Short abstracts of a few more of the papers will be given next week.

The Armor Plate Scandal.

Last week the Chairman of the House Committee on Naval Affairs submitted a preliminary report on the alleged frauds in the manufacture of armor plates by the Carnegie Company. The charges are summarized thus:—

That plates did not receive the uniform treatment required by the specifications of the contract; that false reports of the treatment of plates were systematically made to Government inspectors; that bolts did not receive the double treatment required; that specimens taken from the plates, both before and after treatment, to ascertain the tensile strength of each plate, were stretched, without the knowledge of the Government inspectors, so as to increase their apparent tensile strength when actually tested; that false specimens, taken from other plates, were substituted for specimens selected by Government inspectors; that the testing machine was manipulated by the order of the superintendent of the armor plate mill so as to increase the apparent strength of the specimens; specimens selected by the inspectors were re-treated before being submitted to test; plates selected by inspectors for ballistic test were re-treated with the intention of improving their ballistic resistance, without the knowledge of the Government inspectors; that in violation of the contract, pipes or shrinking cavities, erroneously called blow-holes in plates, were plugged by the contractors and the defects concealed from the Government inspectors; that the Government inspectors' stamp was either duplicated or stolen and used without the knowledge of the inspectors, and that the Government inspector, in inspecting bolts, was deceived by means of false templets or gauges.

Concerning these the report states that the first charge that the plates did not receive uniform treatment is admitted, the explanation being that what was wanted was uniform *results*. The second charge, that of false reports, is held to be proved by the rough records of the company itself of over 700 plates and lots of bolts. Over 95 per cent. of the records examined show changes of the reports to be made to the inspectors, evidently for the purpose of deceiving the inspectors. The third charge as to the double treatment of the bolts is held to be proved. The fourth charge, as to preliminary pulling of the tensile systems, is admitted, but Superintendent Schwab says that it was done without his knowledge or sanction, although he would not have objected to it had he known it. The charge that false specimens were substituted is practically admitted, but held by Superintendent Corey to have been of small importance. The charge that the testing machine was "jockeyed" is also admitted, but it is claimed that the manipulation was legitimate. The charge of re-treatment of specimens is held to have been proved. Superintendent Corey admits that plates selected for ballistic test were retreated without the knowledge of the inspectors, but says that this was done, not for the purpose of improving them, but as an experiment. The charge of plugging blow-holes is admitted, but it is claimed that the plates would pass the requirements of the ballistic test. The charge that the inspector's stamp was duplicated or stolen is not sustained, nor is the charge that the inspectors were deceived by false templets or gauges. The committee considers the Government inspectors to have been negligent in their duty, but not corrupt. It was recommended that the Secretary of the Navy be directed to remove certain specified plates now in place on various vessels and submit them to ballistic test, and that he be authorized to pay the costs of such tests from money heretofore appropriated for the increase of the navy. The resolution covering this point was adopted by the House.

Sanitary District Matters.

Thirty-five proposals for the excavation of Section 15 of the drainage canal were opened last week at the offices of the Chicago Sanitary District. The estimates ranged from $681,975 to $477,717, at which figure the contract will probably be awarded to Wright, Meysenberg, Sinclair & Carry of Chicago. This section is 4,000 feet long and connects the drainage channel with the Desplanes River near Lockport. From this point to Joliet the canal will

follow the river bed, making such alterations as are necessary to secure the requisite depth and width. It is estimated that in this section there are 35,300 cubic yards of glacial drift, 639,000 yards of solid rock, and that there will be required 40,000 entire cubic yards of retaining walls. The lowest bid was: Glacial drift, 19 cents; solid rock, 59 cents; retaining walls, $2.35. The trustees of the district have been notified by Streeter & Kemfick, the contractors for Sections E and F that work will at once be resumed on Section E, which was abandoned over a month ago on account of the character of the material encountered. The contractors on Sections C, D, E and F demanded some months ago that the material on these sections be re-classified and the rate of pay increased. It was claimed by Streeter & Kemfick that they were misled by the notes of the borings made by the board, to which they had access, and that their bid was lower than it otherwise would have been. The matter was referred to Chief Engineer Randolph, who reported that the test borings made, upon which the contractors claimed to have relied, indicated glacial drift, also that test pits lately sunk show glacial drift, but disclose the additional fact that the material to be excavated is of a more difficult character than indicated by the simple borings. He could, however, see no provision in any clause of the contract which would warrant him in changing the classification or advancing the price. The report was accepted as final, and the contractors ordered to resume work within ten days.

The joint committee on finance and engineering has prepared advertisements for bids for swing highway bridges at Romeo, Lemont and Willow Springs. The estimated cost of these bridges is $:00,000. Less trouble is anticipated with these bridges than with the railroad bridges which it will be necessary to build at several points along the canal. The channel will ultimately be 202 feet wide at the bottom for its entire length, though portions of it are to be but 110 feet in width at present. The bridges must, of course, be adapted to the future width of the canal, and as it appears at present that one of them must be a six-track bridge, and one a skew, the problem is not an easy one. There are three other bridges which can not well be avoided, and several more which it is hoped may not be necessary. The Atchison, Topeka & Santa Fe Railroad Company will require four bridges unless granted a right of way on the west side of the canal between Corwith and Lockport.

Train Accidents in the United States in July.

COLLISIONS.

REAR.

2d, on New York, Lake Erie & Western, at Mountainville, N. Y., a freight train ran into the rear of a preceding freight and the caboose fell into a pond. The engineer was injured. In pulling the caboose out of the pond the wrecking car fell in and 2 men were injured.

5th, on New York, New Haven & Hartford, at New Haven, Conn., a passenger train ran into the rear of a preceding passenger train, doing slight damage. It is said that the foremost train failed to send back a signal, because at that point dependence was usually placed upon an automatic block signal, but this signal had been made useless by a big fire which had blocked the road about 12 hours.

8th, on Cleveland, Cincinnati, Chicago & St. Louis, at Wann, Ill., a passenger train ran into the rear of a preceding freight which was running into a siding but had not got in far enough. The fireman was killed and the engineer injured.

9th, on New York, Lake Erie & Western, near Campville, N. Y., a freight train descending a grade broke in two and the rear portion afterward ran into the forward e, wrecking several cars. The conductor was killed.

10th, on Cleveland, Cincinnati, Chicago & St. Louis, near Thorntown, Ind., a freight train descending a grade broke apart in two places and the detached portions afterward collided, wrecking one car. A tramp was injured.

11th, at East St. Louis, Ill., a passenger train of the Wabash road ran into the rear of a Cleveland, Cincinnati, Chicago & St. Louis freight train, wrecking several cars. A brakeman was killed and one passenger injured. It is said that the crew of the freight train was unacquainted with the road.

12th, on Philadelphia & Reading, at Kensington avenue, Philadelphia, an empty engine, which became uncontrollable, ran into the rear of a freight train, wrecking the caboose and several cars and injuring 2 trainmen.

13th, on Chicago & Eastern Illinois, at Momence, Ill., a passenger train ran over a misplaced switch and into some freight cars standing on the side track, badly damaging the engine. The engineer was killed. It is said that the switch was probably misplaced by strikers.

13th, on Northern Central, at Lake, Md., an express train ran into the rear of a preceding accommodation train just starting from the station, badly damaging 2 cars of the latter. The conductor and 4 passengers were injured.

16th, on Lehigh Valley, at Kennedy, N. J., an eastbound freight train ran into the rear of a preceding gravel train, wrecking several cars and pushing some of them upon the westbound track, where they were run into by a westbound freight train. Three trainmen were injured. It is said that the gravel train was not properly protected by the flagman.

16th, on Louisville & Nashville, at Bay Minette, Ala., a freight train ran into the rear of a preceding freight, derailing several cars. The fireman was injured.

17th, on New York, Susquehanna & Western, at Oakland, N. J., a passenger train ran into the rear of a preceding freight, derailing the engine. The engineer was injured.

19th, on Delaware & Hudson, at Esperance, N. Y., a passenger train ran over a misplaced switch and into some freight cars standing on the side track, doing considerable damage. The fireman was killed and the engineer fatally injured. It is said that the switch had been tampered with.

21st, on the Belt Line, at West 46th street, Chicago, a freight train ascending a grade broke apart and the caboose ran back some distance before it was stopped. The engine and the fore part of the train ran on, the men being unconscious of the accident. After proceeding some distance some more cars broke away and ran back into the rear portion of the train, making a bad wreck.

23d, on Cincinnati, Hamilton & Dayton, near Chillicothe, O., a pay car train ran into some freight cars which had accidentally run from a siding on the main track. The engine was badly damaged and the engineer and fireman injured.

23d, 5 p. m., on Dunkirk, Allegheny Valley & Pittsburgh, at Fredonia, N. Y., an officers' train ran over a misplaced switch into some freight cars standing on the side track, making a bad wreck. The engineer and a boy picking up coal under one of the freight cars were injured.

25th, on Missouri Pacific, near Valley Park, Mo., an empty engine ran into the rear of a freight train, wrecking the caboose. The engineer and fireman were badly scalded.

30th, 5 p. m., on Baltimore & Ohio Southwestern, at Cochran, Ind., a passenger train ran over a misplaced switch and into the rear of a freight train standing on the side track, doing considerable damage. The passenger engineer was killed and a fireman and a tramp were injured.

30th, on Cincinnati, Hamilton & Dayton, near Hamilton, O., a freight train broke in two and the detached portions afterward collided, wrecking one car. One brakeman was injured.

And 8 others on 7 roads, involving one passenger train and 11 freight and other trains.

BUTTING.

4th, on New York, New Haven & Hartford, at Seymour, Conn., butting collision between an excursion and a regular passenger train. Two passengers were badly injured.

12th, 1 p. m., on Wisconsin Central, in Chicago, collision between a Baltimore & Ohio freight train and a Wisconsin Central engine, making a bad wreck and damaging a warehouse, parts of which fell upon the train, killing 2 deputy marshals and injuring 3 others.

It is said that the trains were moving toward each other on the same track in consequence of a misunderstanding in orders.

14th, on Louisville & Nashville, at Colesburg, Ky., butting collision between a passenger train and a freight, wrecking 1 engine and 2 baggage cars. One engineer was killed and a fireman injured. It is said that one of the enginemen misread his orders.

18th, on New York, Pennsylvania & Ohio, near Geneva, Pa., side collision of freight trains, badly damaging both engines and injuring 1 engineer, 1 fireman and 1 brakeman. It appears that the train was approaching a block signal station during a dense fog and was not properly controlled.

23d, 2 p. m., on Texas & Pacific, near Atlanta, Tex., butting collision between passenger trains 5 and 6, badly wrecking the front portions of both trains. The engineer, fireman, express messenger, 4 mail clerks and a porter were killed and 2 other trainmen and 1 passenger were injured. It is said that No. 6 miscalculated the time necessary to reach the appointed meeting point.

23d, 7 a m., on Cleveland, Cincinnati, Chicago & St. Louis, at Griffiths, O., butting collision between a passenger train and an empty engine, wrecking both engines and a mail car. One fireman and 2 tramps were killed and 5 passengers and 5 trainmen were injured. The engineman of the empty engine had an order to meet a certain passenger train, but forgot about another regular passenger train which was ahead of the one named in the order.

28th, on Northern Pacific, at South Prairie, Wash., butting collision between an eastbound passenger train and a westbound freight which had run some distance beyond the switch at a meeting point in consequence of the engineman losing control of the air-brakes. There was a dense fog at the time. One fireman was fatally injured and a tramp was killed. It is said that the engineman was a new man, engaged since the strike.

28th, on Union Pacific, at Columbus, Neb., fast mail train No. 3 ran over a misplaced switch and into the head of a freight train, making a bad wreck. A tramp was killed.

And 7 others on 7 roads, involving 2 passenger and 12 freight and other trains.

CROSSING AND MISCELLANEOUS.

13th, on Boston, Revere Beach & Lynn, at Winthrop Junction, Mass., collision between a passenger train and a gravel train, derailing 1 engine and 1 gravel car. An engineer and 1 passenger were injured.

13th, on Wisconsin Central, at Robey street, Chicago, collision between a passenger train and a switching engine, damaging both engines and injuring 3 passengers. It is said that the collision was due to the misplacement of a switch by a new switchman not thoroughly acquainted with the yard.

17th, on New York, Susquehanna & Western, near Pompton, N. J., a passenger train ran into the short freight train, making a bad wreck; engineer, fireman and 1 passenger injured.

17th, on Louisville & Nashville, near East St. Louis, Ill., a freight train ran into a switching freight, wrecking 13 cars. A United States marshal was fatally injured and 2 employees less seriously hurt.

20th, on East Tennessee, Virginia & Georgia, at Dames' Ferry, Ga., a passenger train ran into a freight train which was just about to take the side track. Orders had been given for the trains to meet at that point. Both firemen were injured.

22d, on Columbus, Sandusky & Hocking, near Sandusky, O., a yard engine switching on the main track was run into by a passenger train. The passenger engineer was killed and the fireman injured.

22d, at the Union Depot, St. Louis, Mo., a switching freight train ran into a passenger train, badly damaging the cars. Two passengers were injured. It is said that the accident was due to a misplaced switch.

27th, on Wabash road, at Wear, Ind., the engine of a freight train was disabled by the breaking of an eccentric, and word was sent to headquarters that the train could not be moved; but while the man was gone with the message the engineer put the engine in shape to move and started back after a part of the train which had been left behind. Meantime its rear portion was being pushed forward by a following train, and a butting collision occurred. One engineer and 1 brakeman were killed.

27th, on Chicago, Milwaukee & St. Paul, at Portage, Wis., a passenger train collided with a switch engine. One engineer was injured.

30th, 1 a. m., on Lehigh Valley, near Ithaca, N. Y., a freight train became uncontrollable on a descending grade and ran into some cars at the foot of the grade. The fireman was killed and the engineer injured.

And 9 others on 9 roads, involving 2 passenger and 14 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

1st, on St. Louis Southwestern, near Lewisville, Ark., a freight train was wrecked by running upon a burning trestle. The engineman was burned to death, a brakeman was killed and the fireman scalded.

2d, on Louisville & Nashville, near Anniston, Ala., a passenger train ran off the track on a trestle which had been weakened by fire and 3 cars fell through and were burned up. The passengers escaped before the cars went down. The engineer and 3 other trainmen were injured.

17th, on Atchison, Topeka & Santa Fe, near Denver, Col., a freight train was derailed by spreading of rails and the engine and several cars fell down a bank. The fireman was injured.

24th, 4 a. m., on Baltimore & Ohio, at Hancock, Md., an east bound freight train was derailed by a broken rail, making a bad wreck, a portion of which fell against a sleeping car in a train which had just stopped to take water on the opposite track.

And 2 others on 2 roads, involving 1 freight train.

DEFECTS OF EQUIPMENT.

5th, on Lehigh Valley, near White Haven, Pa., a freight train was derailed by a broken axle and 10 cars were wrecked. A man stealing a ride was killed and the brakeman injured.

14th, on Lake Shore & Michigan Southern, at Cleveland, O., the tender of the engine of a west bound passenger train starting from the station was derailed on a sharp curve and overturned, pulling one pair of driving wheels off the track. It is said that the coupling between the engine and tender did not allow enough slack.

16th, on New York, New Haven & Hartford, at Fairfield, Conn., a freight train was derailed by a broken journal and a brakeman injured.

19th, on Chicago Great Western, near Rich Valley, Minn., 3 cars of a passenger train were derailed by a broken axle. Two passengers were injured.

20th, on Louisville, Evansville & St. Louis, at Valpin, Ill., a passenger train was derailed by the breaking of a truck under the tender. The baggage car was overturned and a passenger standing on the platform jumped off and was killed. Three passengers were injured.

22d, on Buffalo, Rochester & Pittsburgh, near Windom, N. Y., a freight train was derailed by a broken wheel and 12 cars were wrecked. A brakeman was injured.

23d, 7 p. m., on Northern Central, at Havana, N. Y., a freight train was derailed by a broken wheel and 20 cars were wrecked. A brakeman was killed and another man injured.

25th, 4 a. m., on Cleveland, Cincinnati, Chicago & St. Louis, near Carthage, O., a freight train was derailed by the breaking of a truck and 6 cars fell down a bank. A tramp was fatally injured. One of the wrecked cars was loaded with gunpowder.

29th, on Buffalo, Rochester & Pittsburgh, at Carrollton, N. Y., a car in a freight train was derailed by the pulling out of a drawbar which fell upon the track. There was a pushing engine at the rear of the train which kept the cars in motion for some time after the derailment and 14 of them were pushed against the girders of a bridge so as to break it, and let 14 cars fall through.

30th on Pennsylvania road near Lancaster Pa., several cars of a freight train were wrecked by the breaking of a body bolster. A tramp was injured.

31st, on Pennsylvania road, at Pomeroy, Pa., a freight train was derailed by a broken axle, wrecking 18 loaded cars. A brakeman and two tramps were badly injured.

And 11 others on 9 roads, involving 11 freight and other trains.

NEGLIGENCE IN OPERATING.

5th, on Chicago, Fort Madison & Des Moines, near Fort Madison, Ia., a freight train was derailed by a misplaced switch and the engineer and fireman killed.

8th, on Louisville, New Albany & Chicago, near Lafayette, Ind., 2 cars of a passenger train were derailed by a misplaced switch. A mail agent was injured by jumping.

29th, on Boston & Maine, at Lowell, Mass., 2 cars in a freight train were derailed by a misplaced switch and 2 employees were injured.

10th, on Philadelphia & Reading, near Tabor, Pa., the engine and 6 cars of a passenger train were derailed by a derailing switch, which was opened after the train was too near it to be stopped. The engine was overturned and the engineer was fatally scalded. It is said that the signal man became confused at the simultaneous approach of two trains and changed the signals when it was too late.

13th, on Denver & Rio Grande, near Gray's, Col., a freight train became uncontrollable on a descending grade and was derailed on a curve, the engine and 11 cars falling down a high embankment. The engineer was killed and 3 other trainmen were injured.

14th, on Kansas City, Pittsburgh & Gulf, at McElhaney Mo., a freight train was derailed at a misplaced switch and badly wrecked. The engineer and fireman were killed

17th, on Great Northern, at Willmar, Minn., passenger train No 9 was derailed by a misplaced switch and the fireman injured.

19th, on Chicago, & Alton, near Summit, Ill, the engine and first 4 cars of a passenger train were derailed by running over a derailing switch at the crossing of the Belt Line. The mail car was overturned and 3 mail clerks injured, one of them fatally. A United States marshal was also injured.

And 4 others on 4 roads, involving 1 passenger train and freight and other trains.

UNFORESEEN OBSTRUCTIONS.

2nd, on Canadian Pacific, near Moosehead, Me., a passenger train broke through a trestle bridge and the engine and first 3 cars fell about 25 feet. The sleeping car was overturned but did not go down. Two passengers and 3 employees were killed and 3 passengers and 5 employees injured. It is believed that the train was maliciously derailed.

8th, on New York Central and Hudson River at Yonkers, N. Y., the engine of a passenger train traveling at a high speed, was derailed by running over a door which had fallen upon the track from a freight car. The train ran some distance to a bridge where the engine was overturned.

9th, 11 p. m., on Northern Pacific, at Tacoma, Wash., a passenger train was derailed by a misplaced switch and the engine and tender overturned. The fireman was injured. It was believed that the strikers turned the switch maliciously.

10th, on Chicago, Rock Island & Pacific, near Utica, Ill., a freight train was derailed by a loose rail and 19 cars were ditched. It is stated that the spikes had been maliciously drawn.

11th, on Southern Pacific, near Sacramento, Cal., a passenger train, occupied chiefly by United States soldiers who had been called out to quell strike disturbances, was maliciously derailed at or near a trestle bridge and 4 cars fell into the water below. The engineman and 3 soldiers were killed and 4 soldiers were injured. The fastenings at several rail joints had been taken off.

13th, 2 a. m., on Cleveland, Cincinnati, Chicago & St. Louis, at Fontanet, Ind., a passenger train running at high

speed was derailed by a misplaced switch. The engine, baggage car and one passenger car were ditched. The engineer and fireman were killed and 2 postal clerks injured. The misplacement of the switch was doubtless malicious.

13th, on Chicago Rock Island & Pacific, near Pound Pond, O. T., a freight train of 113 cars was wrecked by the explosion of dynamite under a bridge which it was crossing. Three trainmen were killed and several injured. The wrecking was the work of residents who were incensed at the refusal of the railroad company to stop its trains at their town.

13th, on Toledo Peoria & Western at Mariette, Ill., a freight train drawn by two engines was derailed by running over a cow, both engines and 11 cars being wrecked. One engineer jumped off and was killed, and 4 other trainmen were injured.

16th, 3 a. m., on Chicago & Grand Trunk, near Battle Creek, Mich., east bound passenger train, No. 6, was derailed by a loose rail and the engine was overturned. The fireman was killed and 4 trainmen and 5 passengers injured. It is said that the rails had been maliciously loosened.

17th, on Wisconsin Central, at Western Avenue, Chicago, a Baltimore & Ohio train carrying soldiers was derailed at switch, which was misplaced just before the train reached it. There was a crowd of strikers near by, and one of them was arrested for maliciously throwing the switch.

21st, on Philadelphia, Reading & New England, at New Hartford, Conn., a freight train was derailed by a landslide and the engine and one car were ditched. The engineer and one fireman were injured.

29th, on Queen & Crescent, at Trenton, Ga., a passenger train was derailed by a maliciously misplaced switch and the engine and first two cars fell down a bank. Two trainmen were injured.

And 9 others on 9 roads, involving 3 passenger and 6 freight and other trains.

UNEXPLAINED.

1st, on Florence & Cripple Creek, at Anaconda, Col., a passenger train was derailed and several cars fell into a gully. One passenger was smothered to death by being buried in sand. Four passengers and one brakeman were injured.

5th, on Grand Rapids & Indiana, near Mackinaw City, Mich., a dead engine in a freight train was derailed. It is said that the engine was a small one and top heavy and that the train was being run too fast. The same engine had been derailed before.

6th, on Missouri Pacific, near Sedalia, Mo., a freight train was derailed and 13 cars were ditched. Three tramps were killed.

7th, on Wilmington & Northern, near Coatsville, Pa., a freight train was derailed and 6 cars wrecked. Two trainmen were injured.

9th, on Baltimore & Ohio, at Chester, Pa., the tender of a locomotve of an express train running at high speed was derailed and ran some distance on the sleepers, but on reaching a frog it ran upon the track again. It soon went off a second time, but the train was stopped without much damage. The reports indicate that a journal had been burnt off.

13th, on Baltimore & Ohio, at Columbus, O., a freight train was derailed and the engine and several cars fell down a bank. The engineer was killed and the fireman injured.

20th, on Pennsylvania road, at St. Thomas, Pa., 8 cars of a coal train were derailed on the bridge and fell about 50 feet into the river below. Two tramps were killed.

22nd, on Lehigh Valley, near Copley, Pa., a freight train was derailed and 13 cars were wrecked. Three tramps were injured.

And 6 others on 6 roads, involving 1 passenger train and 5 freight and other trains.

OTHER ACCIDENTS.

4th, on Philadelphia & Reading, near Zion's Church, Pa., a valve in the boiler of the engine of a work train blew out and a large volume of steam was thrown into the caboose. One employee jumped off and was fatally injured, another one was scalded and 3 others were less severely hurt.

8th, on Atchison & Santa Fe, near Pueblo, Col., a locomotive was badly damaged by an explosion of the fire-box supposed to have been produced by dynamite maliciousy placed in the coal bin.

12th, on Pennsyvania road, at Cheswick, Pa., a passenger train was damaged by striking a caboose of a freight train, injuring 2 employees and passenger.

17th, on Northern Pacific, near Missoula, Mont., the engine of a passenger train was badly damaged by an explosion of dynamite which had been placed upon the track, probably by strikers. The cow catcher, one cylinder, piston rod and cab windows were broken.

18th, on Fremont, Elkhorn & Missouri Valley near Glen Rock, Wyo., a passenger train was struck by a water spout, said to be "as big as a passenger car," which extinguished the fire in the locomotive.

21st, on Lehigh Valley, near Wayalusing, Pa., a cattle car in a freight train was set a fire by flames from a hot box and some of the cattle were burned. It is stated that the engine man was first apprised of the fire by signals from men at work in a field near the railroad.

27th, on Baltimore, Eastern Shore, near Riverside, Md. the engine of a passenger train was badly damaged by the breaking of a side rod. The engine man was injured.

27th on Pittsburgh, Cincinnati, Chicago & St. Louis in Chicago, Ill., a switching engine of the Chicago, Burlington & Quincy was badly damaged by an explosion of dynamite which had been maliciously placed upon the track. A switchman and a policeman were injured.

And 4 others on 4 roads involving 4 passenger trains.

A summary will be found in another column.

TECHNICAL.

Manufacturing and Business.

The Brown & Sharpe Manufacturing Company of Providence, R. I., resumed work in all departments on August 20, after the usual annual vacation.

Mr. William Biddle, inventor of the Biddle system of electric car lighting, announces that he has severed his connection with the American Railway Light Co., and has formed the Biddle Railway Car Electric Lighting Co., which will develop his patents on improved apparatus. Mr. Biddle's office is at 108 Fulton steet., New York.

The Berlin Iron Bridge Co., of East Berlin, Conn., has received the contract for the new plant for the Fairfield Copper Co., at Monroe, Conn. The plant will be entirely of iron and stel.

The new power station for the Hartford street railway Co., at Hartford, Conn., will be designed and built by the Berlin Iron Bridge Co. of East Berlin, Conn. It will be 66 ft. wide and 233 ft. long, with a steel frame covered with The Berlin Iron Bridge Co's. patent anti-condensation corrugated iron covering and will be fire-proof.

Judge Swan of the United States Circuit Court at Detroit in a decision rendered on August 21 denied the motion for a rehearsing in the Cody patent case, thereby affirming a previous decision of the same court in favor of the Consolidated Car-Heating Co., of Albany, N. Y.

Jones & Laughlins of Pittsburgh, Pa., have ordered from the Morgan Engineering Co., of Alliance, O., one of the latter's 15-ton electric motor traveling cranes, for use in a new roll shop now being built at their mills.

The Cleveland, Cincinnati, Chicago and St. Louis has given an order for about 8,000 steel posts to the International Steel Post Co. of Chicago. This makes about 10,000 of these posts purchased by this railroad company to date. The previous orders were small and were distributed along different divisions of the road for trial. It appears that the railroad company thinks the trials sufficiently satisfactory to justify it in ordering a larger number.

Bids were opened on August 22, by the Department of Public Works, New York City, for the construction of an engine and boiler house, tower and chimney for the high service water works at the new aqueduct between Tenth Avenue and Harlem River. There were five bidders as follows: J. R. F. Kelly, $81,210; J. D. Murphy, $82,418; Thomas Dwyer, $84,500; Isaac A. Hopper, $87,327; John J. Hopper, $94,818. The contract has been awarded to James R. F. Kelly. The building, which is to be very elaborate in all its appointments, is L-shaped and covers an area of 14,900 sq. ft. The plans for the steel roof were made by Mr. Alfred P. Boller, Consulting Engineer.

The new plant of the Ellwood Shafting and Tube Co., at Ellwood, Pa., is ready for operation.

The Chilled Roll Foundry, of Apollo, Armstrong County, Pa., with a capital stock of $100,000, was chartered at Harrisburg, Pa,. last week with G. G. McMurtry Allegheny, President; William Boyd and V. Preston of Pittsburg, Directors,

The Bloomsburg Manufacturing Co. was also incorporated, to manufacture iron and steel, with a capital stock of $250,000. F. J. Richard, is President, J. L. Richardson, J. I. Richard, George C. Ray, George J. Richard, all of Bloomsburg, Directors. The Berry Engineering Co., of Chester, was also incorporated.

The Barney & Smith Car Co., has declaired its regular quarterly dividend of 2 per cent on its preferred stock, payable September 1.

The annual meeting of the Colorado Fuel and Iron Co., was held at Denver, Col., on August 1,. The directors elected were: J. C. Osgood, H. R. Wolcott, Dennis Sullivan, W H. James, C. H. Toll, J. L. Jerome, J. A. Kibbler, A. C. Cass, D. C. Beeman, W. L. Graham, Paul Morton, E. Thalman, G. H. Prentice; J. C. Osgood was elected President.

The United States Equipment Co., with a capital stock of $62,000, has been chartered at Topeka, Kan. The object is to manufacture, operate and lease railroad equipment.

The American Car Co., which built works at Basic City, Va., during 1892, is reported to have made an assignment.

Iron and Steel.

The Colorado fuel and Iron Co., has received an order for about 15,000 tons of steel rails to be used in building an extension of the Choctaw Coal & Railway Co.

The bridge and construction department of the Pennsylvania Steel Co., at Steelton, Pa., is running on full time, and has several large orders on hand. The company is completing the material for a large bridge to be erected on the line of the Boston & Maine.

The Mabel and Ella furnaces, the Sharon Iron Works and the Stewart furnaces at Sharon, Pa., resumed work on August 23, giving employment to about 1,500 men.

The plants of the Burden Iron Co. and the Albany Iron Works, in South Troy, N. Y., resumed operations on August 27. For several months these works have been practically idle.

John Entrekin, Coatesville, Pa., has been awarderd the contract for two or more large buildings to be erected at the Lukens Iron Works at that place. They will include a machine shop, testing room and several other departments.

The Maryland Steel Co., has received an order for 300 tons of rails and fittings from the Cape Fear & Yadkin Valley Railroad.

The Pottsville Iron & Steel Co. has confessed judgment in the sum of $141,000, owing chiefly to the estate of C. M. Atkins, the founder of the company, for loans. It is announced that the works will remain open without material reduction in the number of men employed, about 600 being now on the pay roll.

The Phoenix Iron Works, of Phoenix, Pa., are now running on three-quarter time. It is now employing 2,200 men. The Valentine Iron Co., at Bellefonte, Pa., is now employing over 500 men. Its blast furnace was started up last week after being idle since the coke strike was inaugurated.

New Stations and Shops.

The Baltimore & Ohio has begun the excavations for a passenger station at Harper's Ferry, W. Va.

The Colorado Coal and Iron Company has just closed an order for 12,000 tons of steel rails for the Choctaw Coal and Railway Co., of the Indian Territory. The works of the company at Bessemer are now running at full capacity.

It is reported that the Baltimore & Ohio Railroad is preparing plans for new locomotive shops to be located at Cumberland, Md. The company has had under consideration for some time the question of making Cumberland to the Baltimore & Ohio, what Altoona is to the Pennsylvania Railroad. At Cumberland are located the company's rolling mills which, when first built, were operated for a time by the company, but which during recent years have been leased to private companies that have operated the mills only at intervals. Cumberland was for years an intermediate station except that, since the construction of the Pittsburgh division, it has been the terminal of that division. Now, however, it is the terminal of three divisions; one from Washington to Cumberland; another from Cumberland to Grafton; and the Pittsburgh division, from Cumberland to Pittsburgh. Whether or not the new shops are merely to give facilities for doing the increased amount of work that will naturally be required at Cumberland on account of the re-arrangement of the divisions, or the beginning of the plan to make Cumberland a locomotive building center is not said.

Chicago Main Drainage.

The work on section A of the Chicago Main Drainage Canal is impeded by the nature of the soil on a large part of the section. The principal trouble thus far has been on river diversion which for a distance of about three miles along sections A, B and C carts the water of the Desplaines River, the original bed of the river having been for a part of that distance on the line selected for the drainage canal. The river diversion cuts across a bend of the river and was computed to all appearances some time since, though not without apprehension as to its permanency. The soil on this section is muck of such a consistency that it can be pumped, but too fibrous to be washed away by a flood. To re-enforce the river diversion and prevent flood waters of the river from reaching the drainage canal, a levee was built of earth and stones from other sections. This levee gradually sank, pushing out muck on each side and partly filling the river diversion. While the quantity to be removed is not great, amounting only to 250,000 or 300,000 cubic yards, it is feared that a heavy flood on the Desplaines River would overflow the levee at some point and cause considerable damage along the drainage canal. It is the intention to begin the removal of this material as soon as settlement of the levee ceases. The same material is met with on two sections of the drainage canal. This condition was anticipated by the engineers, but its character and extent were underestimated. The question of maintaining the stability of the main channel through the muck was problematical, and its presence necessitated some modifications in the contracts on sections A, B and C. It was stipulated that this muck should be pumped off by means of hydraulic dredges for a width beyond the limits of the main channel of not less than five times the depth of the muck bed; that sufficient hard material should be banked up against the edge of the muck to keep it from sloughing into the channel after it had been pumped out, and that afterward the hard material underlying the muck should be thrown upon the embankment.

Another Chicago Lift Bridge.

The Northwestern Elevated Railroad Company of Chicago has submitted to the War Department the plans for its bridge across the river at Wells street. The plans provide for a lift bridge on the same principle as the one constructed at Halsted street. The span is much longer, however, and has to be raised to the same height. The towers on each side of the river will be upwards of 200 feet high, and the bridge must be raised a clear 150 feet above the water for the passage of vessels. The span is to be 206 feet long.

An Ash Hoist.

A novel scheme for elevating ashes from a track pit to cars is employed by Mr. H. M. Smith, Master Mechanic of the Terminal Railroad Association of St. Louis. In the pit where the ashes are dumped from the locomotives are placed large sheet iron buckets, which fill the full width of the pit, and are as long as the longest ash pan. The ashes are dumped from the locomotive ash pans into these buckets and the wrecking crane, the storage yard for which is a continuation of the pit track, is used to hoist the buckets so that they may be dumped into the cars standing on the adjacent track. The business of the Terminal Association is such that any obstruction occurring on its tracks must be removed at once; for this reason steam pressure is always carried in the boiler of the wrecking crane and the crane can be used for elevating the ashes without any trouble and with but little expense.

The New York Canals.

The Committee of the New York State Constitutional Convention has reported adversely the amendment authorizing the expenditure of $20,000,000 on canal improvement. The ground taken by the committee is that it is an affair for legislation and not for constitutional amendment.

Nicaragua Canal.

Representatives of the Nicaragua Canal Co., who are now in England, are reported to have said that it really makes little difference whence the money comes, inasmuch as the canal must always be neutral and open to

the world's commerce. This is precisely the positon that we have always taken, and we are glad to have such a statement from the representatives of the company itself.

Car Heating.

The Missouri, Kansas & Texas Railway is equipping 75 of its passenger coaches with the Safety Car Heating & Lighting Company's system of heating by hot water circulation and 10 baggage cars with direct steam. This road has already over 100 cars equipped with the Safety Company's heating systems, which have been adopted as its standard.

Electric Tail Lights; Chesapeake & Ohio R. R.

Two passenger trains on the Chesapeake & Ohio Railway have been provided with electric tail lights by the chief electrician, Mr. W. S. Greene. A parlor and observation car is attached to the train that leaves Cincinnati about noon each day, the car being dropped at Hinton and returning to Cincinnati next day. The two observation cars that are required to give this service are lighted by incandescent lamps. The electric wires are run to the tail light brackets and one connection is made through the bracket and the other through the lamp base, which fits in the base of the regular lamp casing replacing the cup which usually holds the oil and wick. If for any reason the electric lamp cannot be used the oil lamp may be substituted in the same casing. The electric lights are very bright. The two cars are also provided in the observation end, with electric fans which are operated by the same batteries that give the current for lighting.

A New Drawn Steel Trolley Pole.

The United States Projectile Company, of Brooklyn, N. Y., manufacturers of the patent hot-pressed motor pinion, which has met with success, have, after many experiments, perfected an improvement in trolley poles which materially reduces the weight as compared with the ordinary pole, and will give a stronger rod. The process is similar to that used by the company in manufacturing bicycle tubing, and the material is the same. The pole is started from a solid block of steel 3¾ in. in diameter and 7 in. long, and is gradually drawn out until it is the standard length, i. e., 12 to 13 ft., and is then tapered, making a neat-looking pole. A fine grade of Swedish steel is employed, and the pole by this process is said to be 25 per cent. lighter than the common one, and stronger, which, by relieving much of the tension on the wire, will lengthen its life. About 200 of these poles have been used on the Brooklyn Heights Railroad during the last six months, and that company reports that only one of that number has been broken beyond repair. An average of from six to ten breakages of the common poles are reported daily on this road.

New York and New Jersey Bridge.

The report of the Board of Engineers appointed by President Cleveland to investigate and report upon what length of span should be required in building the bridge of the New York & New Jersey Bridge Co., across the Hudson River at New York City, and other details of the structure, submitted its report to the Secretary of War last week. The Secretary of War has declined to make public the text of the report or give any idea as to the conclusions arrived at by the Board of Engineers. The Board, it will be remembered, consisted of Major C. W. Raymond, Corps of Engineers U. S. Army, Theodore Cooper, George S. Morison, W. H. Burr, of Columbia College, and L. F G. Bouscaren. The report which they have submitted is understood to have been unanimous in its conclusions.

The Cranes at the Brooklyn Works of H. R. Worthington.

In our issue of the 17th, the statement was made that the Shaw Electric Crane Co. had given an order for a 30-ton crane for the Brooklyn works of Henry Worthington & Co., which crane was to "supplement a Morgan electric crane." A letter from the President of the Worthington Co. informs us that the crane ordered of the Shaw Company is to be used in the loam foundry. The crane built by the Morgan Engineering Co. is at work in the green sand foundry, which is a separate building and is doing good work and there are no complaints to make of its performance. The order for the new crane was placed after competetive bids had been received from the Morgan Co. and three other well-known builders. The Morgan Co., claims to have constructed fully 75 per cent. of all the traveling cranes used in the country, and that it is to-day taking orders for a like proportion of this class of machinery.

Chilling Test Pieces With Liquid Carbonic Acid.

Writing on the use of liquid carbonic acid gas for chilling test pieces, especially stone, iron and steel, at low temperatures, M. Ph. v. Haller, in the *Industrie Zeitung* of Riga, says that a cheap and simple form of apparatus in which the test specimens could be cooled would consist of a wooden box with double walls, top and bottom, the spaces between being filled with some non-conducting substance. The liquid gas could be led into such a box from the iron or steel flasks in which it is furnished, and would be deposited in great part in the form of frost at a temperature of about −78 degrees Centigrade. The test specimens could be readily put into and taken from such a box, and would quickly get a low temperature. One of the Russian railroad companies is on the point of having such an apparatus constructed for testing rails and wheel tires at low temperatures. The possibility of accomplishing the desired object with such an outfit, viz., the rapid freezing of specimens, was demonstrated by putting a number of iron test pieces into a bag of several thicknesses of coarse cloth and then introducing the liquid gas. This at once became solid and filled all the spaces between the specimens which thus lay packed in snow. Each specimen was provided with a depression into which mercury could be poured, and on doing this, after a short exposure in the freezing bag, it was found that the mercury immediately solidified, showing, in the absence of a suitable thermometer, that the temperature of the specimens was certainly below −39 degrees C., if not lower. At the St. Petersburg Laboratory of Experimental Medicine a cold room of quite large proportions has been fitted up in which also liquid carbonic acid is the cooling agent.

THE SCRAP HEAP.

Notes.

The Chesapeake & Ohio has commenced the work of putting in track tanks between Sewell and Thurmond, W. Va.

The Texas State Railroad Commission estimates the valuation of the Houston and Texas Central Railroad at $9,588,903.

The sub-committee of the House Judiciary Committee has determined to postpone its investigation of the charges against Judge Ricks, of Cleveland, until after November.

The New York Central & Hudson River has presented to the State of New York a claim for $93,123 for damage to the Adirondack Division of the road in Remsen, N. Y., caused by backwater from a dam built by the state.

The contest between the Interior Department and the railroads operating in Oklahoma has finally been settled by the enactment of a law compelling the roads to maintain stations at all town sites on the lines established by the department.

Suit has been brought by the receivers of the Northern Pacific, to set aside and cancel all taxes and assessments levied against the lands of that railroad in North Dakota during 1888. This suit affects thirty counties and involves a large sum of money.

The New York Central has given notice that it will decline to receive from connecting roads any railroad mail for New York except when addressed to officers and agents of that company. This action is taken to abolish the custom of connecting roads sending business mail to their agents located at New York City.

The receiver of the Oregon Railway & Navigation Company announces a reduction of wages of employees. Employees drawing over $100 per month, are reduced to 12½ per cent.; those drawing over $50, to and including $100, 10 per cent. The foregoing reduction applies to and has been accepted by all employees of the operating department, except trainmen, for whom a new schedule will likely be made.

Judge Williams, of the United States court has, issued an order restraining the Arkansas State Board of Railroad Commissioners from assessing the property of the Pacific Express and all other express or telephone companies operating in the state. This action is taken pending the ligitation now before the United States Court as to the right of the state to tax the property of such companies when the same is situated outside of the state.

The California Traffic Association, the San Francisco organization of merchants, of which Mr. J. S. Leeds is Commissioner, formed for the purpose of more effectually dealing with the railroads, has announced an "independent ticket" for state railroad commissioners. The nominees of the Association are Charles F. Reed, of Placer County, Thomas R. Minturn, of Fresno County, and Alfred J. Marcus, of San Mateo County. The members of the Traffic Association are asked to endeavor to secure the election of these men irrespective of party affiliations.

It is reported that the Buffalo grade crossing commissioners have decided to ask the Supreme Court of the State to compel the New York, Lake Erie & Western, Delaware, Lackawanna & Western, the New York, Chicago & St. Louis, the Lake Shore & Michigan Southern, and the Buffalo Creek railroads to join the city, without delay, in abolishing grade crossings in the city. It appears that the New York Central and the Lehigh Valley have finally come to a complete agreement with the Commissioners, but we do not learn that work has yet been begun.

The freight house of the Cleveland, Cincinnati, Chicago & St. Louis, at Third and Wood streets, Cincinnati, was burned on August 21, together with eighteen freight cars and thirty passenger cars, including some Wagner sleepers. The loss was about $300,000. The wreck of a freight train on the New York Central near Buffalo on the morning of the 18th is said to have occasioned a loss of about $100,000. The train broke in two, and the parts came together, causing the explosion of an oil tank. Eleven oil cars exploded in quick succession, and about fifty cars were burned altogether. The freight house of the Chicago & Northwestern, at Indiana street, Chicago, was burned August 21. Loss, $40,000.

Mail Cars on Street Railroads in St. Louis.

Readers of the *Railroad Gazette* will remember the announcement of the establishment of a distributing mail car line on an electric street railroad in St. Louis a year or two ago. Since then, similar cars have been talked of in other places and have actually been put on in Montreal and Brooklyn. As there has been some difference of opinion, among people not fully informed, as to the utility of this arrangement, we have made inquiry of an official at St. Louis, who assures us that the service in that city is highly satisfactory. He gives the following particulars:

The line of the St. Louis & Suburban electric road leaves the corner of Sixth street running west on Locust, past the post-office, and terminates at Florissant, twelve miles beyond the city limits and eighteen from starting point. It supplies, besides the sub-stations, the offices at Wellston, Normandy, Kinlock and Florissant. There are two cars, one being kept in reserve.

The first car leaves the post-office at 6.10 a. m. It makes deliveries, at sub-station 14, to six carriers; at sub-station 11 to eight carriers; at sub-station 12 to ten carriers; at station C, to 22 carriers. Each of these carriers receives, on an average, three large packages of letter mail and one canvas sack of paper mail. On the return trip this car stops for collections, which will average about 1,500 letters. On the second trip the car leaves at 9.40 a. m., delivering within the city only, at nine stations, to 52 carriers; collecting upon the return trip an average of between 4,000 and 5,000 letters. The third trip is made at 1.45 p. m., and is the same as the first. The number of letters taken out is about as heavy as on the first trip, but the papers delivered are less in number. The collection on the return trip averages about 7,000 letters.

Letters are also carried on the Sixth Street Electric line, for a distance of about six miles, but this is a service entered into by a contractor to relieve his wagon delivery, and is paid for by him and not by the Government.

There is no question as to the efficiency of this service, or its desirability upon the lines where used.

Machinery and Labor.

A resolution has passed both houses of Congress directing the Commissioner of Labor to report upon the effects of the use of machinery upon labor and upon the cost of production. Ten thousand dollars has been appropriated for this work, which seems a very small sum considering the enormous field which the inquiry should cover.

Railroad Taxation in Montana.

The Montana State Board of Equalization has apportioned the railroad taxes for the present year among the several counties of the state. There are railroads in 20 counties, and the total assessment is $9,962,454 on 2,722 miles.

Chicago Elevated Railroads.

Excavation has been begun for the power house of the Metropolitan West Side Elevated Railroad on its line between Throop and Loomis streets, just to the west of the old electric light station belonging to the city. The building will be 600 feet long, 90 feet wide, and have an average height of 70 feet. Only one half of this will be put up now, the other being added as the extension of lines demands an increase of power. It will be of steel construction, with red brick walls and plate roof, and will be fireproof. The cost will be about $800,000, and it is expected that it will be completed December 1. The engine room will be 300 feet long and afford space for eight engines, and the boiler equipment will be in a separate house, and will consist of thirty-six boilers of 300 horse-power each. Sixteen stations along the line of the road are nearing completion, while contracts have been let for fifteen others. The average cost of the stations is $11,000. Four engines have been ordered from the E. P. Allis Company, of Milwaukee, two to be of 3,100 horse-power and two of 1,500 horse-power. These engines will be of new design, cross-compound, condensing, vertical, direct-connected. The dynamos will be furnished by the General Electric Company, two of which are of 1,500 kilowatt, and two of 80 kilowatt capacity. The company has also ordered 100 motors of the General Electric Company for the equipment of fifty trains.

Sanitary District Bonds—Chicago.

The bids for the third series of $3,000,000 worth of five per cent. bonds of Sanitary District of Chicago, have been opened by the Board. The highest bid for the whole issue was made by N. W. Harris & Co., of Chicago, of $100.57 on the face of the bonds, and the bid was accepted by the trustees of the Sanitary District. This is the same firm to which the second issue of $3,000,000 was sold on December 13, 1893, for $101.79. The present issue is to be delivered in three installments of $1,000,000 each on the first day of September, October and November, though the purchasers have the privilege of taking the bonds faster if they desire to do so.

The monthly report of the Board shows that the expenditures for July amounted to $553,692, of which amount $531,074, was for construction, and $20,320 for land payments. The average number of men at work during the month was 5,100. Trains 617, locomotives 23, cars 310, and scows 16. The work performed was 17 per cent. above estimate.

The "Good News."

The American Sunday School Union has recently put into service a "Sunday school car," and it is now making a trip through Illinois, Iowa, North and South Dakota, Nebraska, Minnesota and Wisconsin in the interests of that organization. The car is christened the "Good News" and was built at the Jackson & Sharp works. The interior is fitted up with kitchen and pantry in one end. The middle of the car contains berths to accommodate 20 people. The remainder of the car is fitted up as an audience room and furnished with leather, upholstered chairs, sofas and writing tables. The rear platform is vestibuled and has a temporary platform which can be extended for the use of the speakers. The men now with the car are under the direction of Mr. E. B. Stevenson, of Cedar Rapids, Iowa, the assistant superintendent of the Union. The plan is to stop at the various mission towns for two or three days at a time and hold services for the children in the daytime, and evangelistic services in the evenings. The railroads transport the car free and will run excursions to points where it stops, when thought advisable. This is the third mission car in active service in the northwest. The other two cars are operated by the Episcopal and Baptist societies, respectively.

Colorado Fuel and Iron Co.

The second annual report of the Colorado Fuel & Iron Co has been issued. The company, in spite of unfavorable commercial conditions, succeeded in earning all its fixed charges and a surplus of $126,842 besides. The net earnings were $862,109, a decrease of 42 per cent. from the preceding year. The tonnage statement shows a decrease of 1,037,547 tons of coal and coke produced, or 42 per cent. This is accounted for because of the miner's strike, the mild winter, depression of the silver mining and smelting industries and the general business depression. The report says of the iron business: "In the iron department, notwithstanding the unfavorable conditions, the showing under all circumstances is very gratifying, and strengthens the confidence heretofore expressed in the

future of this branch of the business of the country. Competition has been very keen and prices greatly reduced; the company has not been in a position to make many of the needed improvements contemplated when the consolidation was effected, and the financial stringency has made it necessary to carry light stocks of supplies and manufactured material, which has made it difficult to operate the various departments to the best advantage." During the year the bonded indebtedness was reduced $33,000. No portion of the $6,000,000 general mortgage bonds has been disposed of. Under the terms of the mortgage the company now has $1,939,000 of these bonds, which it can dispose of when conditions are favorable. A sale of general mortgage bonds which would enable the company to pay off its bills payable and loans upon bonds, would place the company in excellent financial condition, and would enable it to resume the payment of dividends on preferred stock in cash. The report concludes as follows: "The prospects of the iron department are particularly gratifying. The inquiries for steel rails and the necessities for renewals of roads now in the hands of receivers, and therefore in a position to make purchases, make it probable that the rail mill can be kept in profitable operation most of the year. There has been a steady increase in the demand for merchant iron and steel and all other products of the works at Bessemer, and prices, which were very much demoralized during the past year, have now been restored to a basis that promises a reasonable profit." The company produced 1,338,786 tons of coal and 183,246 tons of coke. In the iron department there were produced 30,727, long tons of pig iron, 2,588 tons of spiegel, 34,152 tons of steel rails, and 5,823 tons of merchant bar.

The New York & Long Island Bridge.

Ground was broken on the New York side on August 20 for the piers of the bridge which will be erected over the East River from the foot of 64th street, New York City, to Ravenswood, Long Island. The bridge will have six piers, two on the New York side, two on Blackwell's Island, and two on the Long Island side. A temporary injunction has been issued restraining the construction company building the bridge from erecting the piers on the New York side.

LOCOMOTIVE BUILDING.

The Brooks Locomotive Works, of Dunkirk, N. Y., have just finished the first locomotive of the 60 ordered by the Central Railroad of Brazil. It is of the 12-wheel type, with 21 in. x 26 in. cylinders and weighs 172,000 lbs. in working order without the tender. It is built for a 5 ft. 3 in. gage. The engine and tender are painted dark green and finished in brass and gold leaf. The cab is made of American oak and finished in natural color.

CAR BUILDING.

The Ohio Falls Car Mfg. Co., resumed operations on August 27, after a year's idleness, with a force of 1,500 men. The company has been awarded a contract to build 700 cars for the Pennsylvania Railroad, and is bidding on cars for Illinois Central Railroad lines west of Pittsburg.

The Maine Central order for cars, which has been talked of for a good while, is announced to have been indefinitly postponed. General Manager Tucker states that an order for 1,000 cars was considered, but he has decided to postpone any award for the present.

We mentioned last week that the Pennsylvania Company was asking bids on an order for from 300 to 500 cars: the facts are that the company asked bids on 700 class "XG" box cars to fill vacant numbers. The Ohio Falls Car Company, of Jeffersonville, Ind., secured the order. The cars will have the Pennsylvania standard track, Winslow roof, Wagner doors, National Hollow brake beams, and Janney Couplers; all of which are present standards on the Pennsylvania.

The Goodwin Car Co., of Chicago, is receiving bids on 100 of its standard dump cars, 70 of which have already been let to be used in the handling of material for the elevation of the Lake Shore & Michigan Southern and the Chicago, Rock Island & Pacific tracks in Chicago. The Goodwin cars are arranged to dump either on one or both sides or between the rails and these operations may take place singly or all at the same time. The feature of the car is that, in dumping, neither the load nor the car body is raised. It is claimed that the car is the only one that will dump coke.

BRIDGE BUILDING.

Chester, Pa.—The engineers of the Philadelphia, Wilmington & Baltimore are making preparations to erect an iron bridge over Chester Creek. The span will be about 125 ft. The present bridge was erected only a few years ago, but it has become necessary to widen it to accommodate another track. The work will cost about $50,000.

Knoxville, Tenn.—The West Knoxville City Council has voted to issue $38,000 of bonds to build an iron bridge across Third Creek, connecting West Knoxville with the old city.

Osceola, Wis.—The President has approved the act authorizing the constructing of a bridge across the St. Croix River between Wisconsin and Minnesota, at Osceola.

Pittsburg, Pa.—The plans prepared by the City Engineer of Pittsburgh for the proposed free bridge across the Allegheny River at the foot of 22nd street, have been approved by the War Department at Washington, D. C., with some changes, which have been readily accepted by the city. The principal change is the provision that the channel shall not be less than 500 ft. long. The appropriation for the bridge is $300,000. It is expected that bids for building the structure will be called for during September.

Rumford Falls, Me.—The town officers have called for proposals for the building of a steel bridge across the Androscoggin at that place.

Scranton, Pa.—Councils have passed the Linden and Roaring Brook Bridge ordinances on second reading. The city engineer has prepared plans for the structures.

Sioux City, Iowa.—Farnsworth & Blodgett, of Kansas City, Mo., have received the contract for building a bridge over the Floyd River at Fairmount avenue.

South St. Paul, Minn.—Work was begun on the foundation for the piers of the steel combination railroad and wagon bridge of the South St. Paul Belt Line Railway Company, across the Mississippi River, on August 20, by Charles Stone, of St. Paul, who has the sub-contract for the masonry sub-structure and the approaches, exclusive of the superstructure. The work will be pushed without intermission during the winter and the substructure is to be completed on March 15, 1895. The steel superstructure, which will be erected by the Pittsburgh Bridge Co., will be completed about April 1, '95. The swing span will be 440 ft. long; the other five river spans each 140 ft., and the steel trestle approaches in 30 ft. and 40 ft. girder spans will make the total length of the steel structure nearly 2,600 ft. The highway floor will be 16 ft. above high water leevl and 18 ft. wide in the clear. The railroad floor, single track, will be 18 ft. above the wagon floor. The plans were prepared by and the work will be executed under the supervision of C. F. Loweth, of St. Paul, Chief Engineer of the Company.

Washiugton, D. C.—Among the recent bridge bills approved by the President are the following:—one for a wagon and foot bridge across the Chattahoochee River at Columbia, N. C., one for a bridge across the Pardio River between the states of Florida and Alabama, and one authorizing the Purcell Bridge and Transit Company to construct a bridge across the South Cameron River at Lexington, O. T.

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Wellsboro, Pa.—Last week the County Commissioners let the contract for building two bridges to the Owego Bridge Co. One will be built at Chase's Mills, near Fall Brook, over the Tioga River, and the other over North Fork Creek in Brookfield. The cost of the two will be $2,145 and the work is to be completed by October 15.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago & Alton, quarterly, $2 per share, payable Sept. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Chicago, Milwaukee & St. Paul, annual, Milwaukee, Wis., Sept. 22.

Iowa Central, annual, Chicago, Ill., Sept. 7.

Louisville, New Albany & Chicago, annual, Indianapolis, Ind., Sept. 19.

New York, Susquehanna & Western, annual, Jersey City, N. J., Sept. 6.

St. Louis Southwestern, annual, St. Louis, Mo., Oct. 2.

Toledo & Ohio Central, annual, Toledo, O., Sept. 3.

Toledo, St. Louis & Kansas City, Toledo, O., Sept. 12.

Wabash, annual, St. Louis, Mo., Sept. 11.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Roadmasters' Association of America* will hold its annual convention in New York city, beginning Sept. 11, and lasting three days. The first meeting will be held in Tammany Hall, and the following ones at the Broadway Central Hotel, which will be the headquarters of the Association.

The Master Car & Locomotive Painters' Association will hold its annual convention at Buffalo, N. Y., on Sept. 12, 13, 14. The headquarters will be at the Genessee Hotel.

The *American Association of General Passenger and Ticket Agents* will hold its semi-annual meeting at the Hotel Frontenac, Quebec, on Sept. 18.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York city, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station, on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 51 Lakeside Building, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m. The next meeting will be held on September 19.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St Louis, on the first and third Wednesdays in each months.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minnapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Foundrymen's Association* meets at the Manufacturers' Club, Philadelphia, Pa., on the first Wednesday in each month.

International Congress of Hygiene.

The seventh International Congress of Hygiene and Demography will be held at Budapest, Hungary, on September 3 to 8. A very large number of papers have been announced, some of which will be of value to engineers. Members of the American Society of Civil Engineers are invited to attend and become members of the congress on payment of a fee of 10 florins.

The Association of Bridge Superintendents.

The fourth annual meeting of the American International Association of Railway Superintendents of Bridges and Buildings will be held at Kansas City, Mo., beginning October 16. We suggest that among the other interesting and useful work which this association is sure to do it should change its name, which is now comprehensive certainly, but difficult to remember and burdensome to write.

Convention of the Traveling Engineers' Association.

The Committee of Arrangements of the Traveling Engineers' Association, W. O. Thompson, chairman, has issued a circular giving information relating to the second annual convention to be held at Denver, Col., commencing on Tuesday, September 11, at 9 a. m. Headquarters will be at the Albany Hotel; rates, $2 a day (American plan). The meetings of the convention will be held at the Elks Hall, 1,515 Lawrence street. It is thought that there will be no trouble in securing transportation for members and their families desiring to go to the convention if asked for in the usual manner. The Pullman and Wagner Palace Car Companies will make a one-half rate to members and their families to and from the convention.

Western Society of Engineers.

It has been for some time past the practice of the Western Society of Engineers to make each month a trip to some of the points of interest in or near Chicago. The last trip was on August 16, by steamer, to South Chicago, and up the Calumet River to the works of the Chicago Ship Building Company. From here the boat steamed back to Lake Michigan and up to Fort Sheridan, twenty-three miles above the city, stopping en route at Lincoln Park and Evanston. A stop of an hour and a half was made at the fort, the party leaving at 6:30 for the city. The Committee on Excursions has in prospect two trips along the drainage canal and one over a route not yet selected for the fall months.

American Association of General Passenger and Ticket Agents.

The thirty-ninth semi-annual meeting of this Association will be held at Hotel Chateau Frontenac, Quebec, Canada, Tuesday, September 18. The report presented by the committee appointed to consider the question of differences in opinion as to the proper methods of apportionment to be applied in the division of passenger fares, which has been pending for several meetings, will come up for decision, as will also the question with respect to the practice of some ticket agents in applying directly to connecting roads for relief on account of errors in the sale of through tickets, which was presented by Mr. E. A. Ford at the Harrogate meeting.

The committee appointed to formulate a report on the resolutions presented by Mr. Butterfield at the last meeting, which relate to certain changes in the orders for transportation issued by the United States Government, is expected to make a report. Mr. D. J. Flanders, G. P. A. of the Boston and Maine Railroad, will deliver the semi-annual address.

PERSONAL.

—Mr. D. W. Phelan has resigned as secretary of the Johnson Railroad Signal Company, Rahway, N. J., to engage in the railroad supply business at 115 Broadway, New York City.

—Mr. T. O. Troy, Assistant Superintendent of the Virginia Midland and Washington and Ohio divisions of the Southern Railway Co., has resigned, the resignation to take effect September 1.

—The recent report of the resignation of Mr. H. M. Pearce as Assistant General Freight Agent of the Chicago, St. Paul, Minneapolis & Omaha was entirely unfounded. Mr. Pierce continues to hold that office and has no intention of resigning.

—Mr. J. E. Williams, general agent for the Chicago, Milwaukee & St. Paul at Menominee and Marinette, Wis., has resigned, to take effect September 15, to accept that of superintendent and track manager of the new Wisconsin & Michigan road, with headquarters in Menominee.

—Mr Bissell Wilson, Southern Traveling Agent of the Missouri Pacific, has been transferred to Chicago as District Passenger Agent, succeeding Mr. John E. Ennis, who goes into the law department of the company. Mr. Wilson is succeeded at Louisville by Mr. R. G. T. Matthews, who has been Traveling Passenger Agent at that town for the St. Louis Southwestern Railroad.

—Mr. J. A. L. Waddell has been for a month or more consulting engineer of the Northwestern Elevated Railway in Chicago. It is assumed that he will be made chief engineer as soon as the construction begins. As this company has absorbed the Lake Street elevated he will also act as engineer on that line. He his now preparing plans for a half mile extension of double track of the Lake Street line.

—By Royal Decree of July 5, 1894 published in the Official Gazette at Rome, the King of Italy has Knighted Mr. C. A. Barattoni General Passenger and Freight Agent in New York of the London and North Western Railway, and Vice-President of the Italian Chamber of Commerce in that city, conferring upon him the order of the "Coronia d' Italian"; this in recognition of the many important services rendered by Mr. Barattoni to Italian Commerce during his long residence in America.

—Judge E. P. Hill, General Attorney for the Southern Pacific in Texas, announces his resignation from that office, which, however, will not take effect until next January. Judge Hill has been connected with the Southern Pacific lines since 1866, his first position being as local attorney of the Old Buffalo Bayou, Brazos & Colorado Railroad. When the Galveston, Harrisburgh & San Antonio was organized he became General Attorney and has held that position continuously since that appointment.

—Mr. Robert Mather has been appointed general attorney of the Chicago, Rock Island, & Pacific in Illinois and Iowa, to fill the vacancy caused by the death of Thomas Wright, the late general attorney for that company. Mr. Mather has been assistant general attorney for the Rock Island for the past five years. Previous to his connection with this company Mr. Mather practiced law. Mr. Mather will be succeeded as assistant attorney by Mr. Walter Reeves, who has been local attorney for the Santa Fé and Wabash railroads at Streator, Ill.

—Mr. L. R. Andrews has been appointed Superintendent of the Brooklyn, Bath & West End, which is now a division of the Atlantic Avenue Railroad and is operated by electricity. This road was the pioneer line from Brooklyn to Coney Island and has been operated by steam locomotives for 30 years. Mr. Andrews is an old railroad man, having served as telegraph operator, station agent, locomotive engineer and in various positions at headquarters for a dozen years or more. He has been on the Erie, the Elevated roads of New York and the Great Northern.

—Mr. Charles L. Wellington, who was appointed General Freight Agent of the Wisconsin Central a few months ago when the company assumed the operation of its lines after the abrogation of the lease with the Northern Pacific, has been appointed Traffic Manager of the Company, and Mr. John C. McKinnon, who has been secretary of the Milwaukee Merchants' and Manufactures' Association, becomes General Freight Agent in Mr. Wellington's place. Mr. Wellington was formerly General Freight Agent of the Milwaukee, Lake Shore & Western for about five years until the lease to the Chicago & Northwestern.

—Mr. John C. Gault, the veteran railroad official, has been stricken by apoplexy and is in a dying condition at his home in Chicago. He has been unconscious since August 22. Tuesday he was seized with apoplexy while on a visit to the Board of Trade. General paralysis followed in a few hours. Mr. Gault was General Superintendent of the Chicago & Northwestern and later Assistant General Manager of the Chicago, Milwaukee & St. Paul, and then General Manager of the Wabash. He was afterwards arbitrator in special cases for the trunk lines. In 1885 he became General Manager for the Queen & Crescent Lines, and held that office until January, 1890.

—Mr. P. P. Shelby, who for the past year has been General Manager of the Pacific Coast Lines of the Great Northern Railroad, which includes the Seattle & Montana and the Fair Haven & Southern, operating about 160 miles of road has had his title changed to Assistant General Traffic Manager, his office remaining at Seattle, Wash. Mr Shelby was transferred to Seattle as General Manager of the Seattle & Montana and Fair Haven & Southern Railroads in 1892, before those lines had been formally added to the Great Northern Railroad. He was previously for about two years General Traffic Manager of the Great Northern Railroad, having risen to that office from that of Assistant General Traffic Manager.

—Mr. Henry W. Dunne, Superintendent of the New York, Philadelphia & Norfolk Railroad, died at a Philadelphia hotel on August 26, after a short illness. Mr. Dunne has been Superintendent of this railroad since 1885, with headquarters at Cape Charles, Va. It is operated by the Pennsylvania Railroad with which he had been previously connected as a civil engineer. He entered its service in 1375 as a rodman on the line then building between Philadelphia and Valley Creek, and was afterwards employed on the Philadelphia Division. Subsequently he was engaged under Mr. A. J. Cassatt, of the Pennsylvania Railroad, in engineering work near Philadelphia until his appointment as superintendent of the New York, Philadelphia & Norfolk Railroad.

—Mr. James W. Converse, of Boston, in many ways identified with the railroad, banking and manufacturing interests throughout this country, but chiefly near Boston and in Michigan, died at his summer home at Swampscott, Mass., on August 26, aged 86 years. Mr. Converse's first business interests were in the leather firm of Field & Converse, of Boston, but he afterwards retired and became identified with the Boston & Colorado Smelting Co. the Boston Land Co., Mechanics National Bank of Boston, of all of which he was president. Besides these interests he was concerned in the building of the Canada Southern Railroad, and was president of the American Rapid Telegraph Co., and at one time receiver of the Hartford, Erie (now the New York & New England) and Norfolk County Railroads in Massachusetts. His largest western investments were in and around the town of Grand Rapids, whose growth is largely attributed to the investments and foresight of Mr. Converse.

—Bernhard Feind, a well known civil and hydraulic engineer, of Chicago, died at his home in that city on August 2. Mr. Feind was born and educated in Germany and held responsible positions with various railroad companies in that country. He came to America in 1880, remained a year in New York and moved to Leavenworth, Kas., where he did work for several companies. He went to Chicago in 1885, and after some work on the Henepin Canal was appointed Assistant City Engineer in 1886, which position he held until made Consulting Engineer for the city. This position he held until he resigned in order to devote his attention to the plans for the drainage of the World's Fair grounds. He was recently appointed to a position on the engineering staff of the Chicago Sanitary District, but was never able to take up the work. He was a member of the American Society of Civil Engineers, The Western Society of Engineers and the Chicago Academy of Sciences.

—Mr. Charles S. Crane, Assistant General Passenger and Ticket Agent of the Wabash, has been appointed General Passenger Agent of the company, vice France Chandler, deceased, and Henry Von Phul Taylor, formerly chief clerk of the passenger department, succeeds Mr. Crane as assistant general passenger agent. Mr. Crane began his railroad service in 1864. He was for a number of years clerk in a freight office at Toledo, then rate clerk of the Toledo, Wabash & Western. From 1879 to 1883, he was chief clerk in the general ticket office of the Wabash, St. Louis & Pacific Railway in St. Lous. In 1883 he became chief clerk in the general ticket office of the Missouri Pacific and Wabash, St. Louis & Pacific. From 1884 to 1886 he was chief clerk in the general ticket office of the Wabash, St. Louis & Pacific Railway. Since 1886 he has been assistant general passenger and ticket agent of the Wabash Railroad Company. Mr. Taylor has been in the railroad service for 15 years and has been chief clerk in the passenger department of the Wabash since 1886.

—Mr. James N. Lauder died at his home at Concord, N. H., last Tuesday, at the age of 57 years. At the time of his death he was Superintendent of Motive Power of the lines of the New York, New Haven & Hartford, Old Colony system. Mr. Lauder was essentially a motive power man, having been connected with the motive power department of various railroads. About 1882 he became superintendent of motive power of the Mexican Central, thence he went to the Old Colony as superintendent of rolling stock and held that position until the Old Colony was absorbed by the New York, New Haven & Hartford, when he was assigned to the position in which he died. Mr. Lauder was a man of much influence in the Master Car-Builders' and Master Mechanics' Associations, and was at one time president of the latter. Last year he was one of the judges in the Transportation Department of the World's Fair. He was a man of striking personal appearance, of genial manners and fluent speech, and naturally took a prominent place in the assemblages which he was fond of attending. He was a man of good intellectual qualities, and his quick and receptive mind made up in great degree for the want of early theoretical training in his specialty.

—Mr. John Newell, President of the Lake Shore & Michigan Southern Railway and of the Pittsburgh & Lake Erie Railroad died in Youngstown, O., last Sunday. He was stricken with apoplexy while traveling by rail towards Cambridgeboro, Pa., where he was going for a short rest, and was taken at once to a hotel in Youngstown, where he died within 24 hours of the stroke He was buried in Chicago. Mr. Newell was born in Vermont in 1830, the son of a farmer in moderate circumstances, and when he was 16 began his railroad career as rodman on the Cheshire Railroad. A year and a half later he became assistant engineer on the Vermont Central, and had charge of the construction work on a division. He remained with this railroad until 1850, when it was completed. He was then employed on surveys for two or three other railroads and in 1852 went to Cairo, Ill., as engineer of the Cairo City Railroad, and a year later became connected with the Illinois Central as engineer of maintenance of way of the northern section. In 1863 he left the Illinois Central to take charge of construction of the Winona & St. Peter Railroad where he remained until 1865, when the road was opened to Rochester. He then went to Cleveland as president of the Cleveland & Toledo. Two years later he became engineer and superintendent of the New York Central, and one year later returned to the Illinois Central as vice-president, which office he held two years, when in 1871 he was elected president of the company which office he held for about three years and a half. From 1875 to 1883 Mr. Newell was general manager of the Lake Shore & Michigan Southern, and then was elected president of that company, which office he held until his death. Mr. Newell was a remarkable man and an important figure in American railroad history. We shall leave the attempt to write some estimate of his life and work until next week.

ELECTIONS AND APPOINTMENTS.

Atlantic & Danville.—At a meeting held in Portsmouth, Va., for reorganization, the following officers were elected: President B. Newgrass; Secretary and Manager, Adam Tredwell; General Counsel, Alfred P. Tham; General Manager, G. N. Hughes; the directors elected were: B. Newgrass, of London, England; S. Gerst, J. T. Rison, Danville; N. C. Lewis, Lawrenceville; Mayer Lerman, New York, J. W. Berry, Norfolk, and J. T. Griffin, or Portsmouth.

Great Northern.—R. W. Bryan has been appointed acting superintendent of the Montana division, with headquarters at Havre, Mont., vice E. W. Batchelder, resigned; P. P. Shelby has been appointed assistant general traffic manager, with headquarters at Settle, Wash. The following appointments have also been announced: E. S. Jones, traveling passenger agent, with headquarters at Cincinnati, O.; James Robertson, traveling passenger agent, with headquarters at Spokane, Wash.; James Hamlin, general agent at Tacoma, Wash.; W. Harder, general agent freight department, Portland, Ore.; C. E. Dutton, general agent, Helena, Mont.; W. W. Vegan, traveling passenger agent, with headquarters at Fargo, N. D.

C. H. Jenks, has been appointed, Superintednent of the Northern Divsion, to succeed C. C. Ponsonby, transferred.

O. O. Winter has been appointed Superintendent of the Willmar Division. Mr. Winter will also continue in charge of the Breckenridge Division as Acting Superintendent, until further notice.

Mexico, Cuernavaca & Pacific.—W. T. Sprague having resigned as Superintendent, that office has been abolished, and the duties will be performed by the General Manager, D. B. Smith, whose headquarters are at the City of Mexico.

Missouri Pacific.—Bissell Wilson, formerly Southern passenger agent, with headquarters at Louisville, Ky., has been appointed district passenger agent at Chicago, vice J. E. Ennis, transferred to the land department at Chicago; R G. T. Matthews, formerly district passenger agent of the Cotton Belt at Louisville has been appointed Southern Passenger Agent of the Missouri Pacific at Louisville, vice Bissell Wilson.

New York, Lake Erie & Western.—S. Bradley, general foreman, has been made acting master mechanic of the Mahoning division of the road.

South Carolina & Georgia.—J. Hermon has been appointed Train Master with office at Charleston, S. C. The office of chief train dispatcher is abolished.

Wabash.—The following appointments were made last week by General Manager Hays: Mr. C. S. Crane, to be General Passenger and Ticket Agent, vice Mr. F. Chandler, deceased; H. V. P. Taylor, to be Assistant General Passenger and Ticket Agent, vice C. S. Crane promoted, with offices at St. Louis.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Bangor & Aroostook.—The important bridge across the Meduxnekeag river at Houlton, Me. is completed, and the rails north of that town are now being laid. By the middle of September trains will enter Presque Isle, which will be the terminous of track laying this season.

Canadian Pacific.—Reports state that the surveys, begun last winter. on the Crow's Nest cut-off from Dunmore, on the main line to McLeod in Alberta, have been temporarily abandoned and will not be resumed until next spring.

Central Counties.—Good progress is being made on the construction of the new Central Counties railroad, which will extend from South Indian to Rolkand., Ont. This work will be far enough ahead in a couple of weeks to permit the laying of rails from South Indian station, on the Canadian Atlantic roads. The terminous of the work under way is Richmond on the Canadian Pacific, south of Ottawa, and 17 miles east of South Indian, W. R. Hibbard of Ottawa is General Manager.

Choctaw, Oklahoma & Gulf.—J. F. Hinckley, of St. Louis, who was formerly engineer of the St. Louis & San Francisco Railroad, has been appointed Chief Engineer of this company to complete the surveys for the connecting line between the Eastern and Western Divisions of the above railroad, which is the name under which the Choctaw Coal & Railway Co. is to be reorganized. The foreclosure sale of the property is to take place on September 8 at South McAllester, I. T. It will then be purchased by the Philadelphia Reorganization Committee. A contract has been awarded for the construction of the 120 miles of new road between South McAllester and El Reno needed to connect the two divisions of the company and a contract for the 15,000 tons of steel rails has been awarded to the Colorado Fuel & Iron Co.

Ebensburg & Black Lick.—Another consignment of track laying will be completed to Vintondale, P,. within a month.

Keystone & Northern.—Engineers have begun a survey for this road from Keystone, a small place near Elwood City, Pa., to Würtemburg and thence up Slippery Rock valley northerly. The company was chartered a year ago, but has not before taken any steps toward building the road.

Market Street, Richmond & Frankford Elevated.—The company's officers last week made application to the Board of Highway Supervisors of Philadelphia, for permission to begin work north and northwest of Penn street and the Oxford turnpike to Cheltenham.

New Roads.—D. E. Porter, is President of the Eastern Piscatorial Association, which is promoting a scheme to build a railroad from Atkinson Station, N. C., on the Wilmington, Newbern and Norfolk railroad to Bay View, on New River. The road will be three miles long, and it is intended to give connection with the oyster garden at which the Piscatorial association has at Bay View.

Engineer H. S. Josephs of Salt Lake City is engaged in locating a survey of the railroad in Utah county to the hot springs, owned by John Beck. This road will start from American Fork and will run to the Hot Springs on the north shore of Utah Lake, a distance of 5½ miles. The road will be standard gage, laid with 30 lb. rails.

Ohio River & Charleston.—The company last week filed articles of incorporation in Kentucky,. The proposed road will extend from Ashland to Louisa, Ky., and is in reality the organization in Kentucky of the old Charlestown, Cincinnati & Chicago road.

St. Louis & Atlantic.—This company filed articles of incorporation in Illinois last week. The incorporators are: Thomas L. Fekete, E. C. Rhodes, Walter E. Beckwith, Arthur M. Beckwith and Martin D. Baker. The company is to construct a road from East St. Louis through St. Clair, Madison, Clinton and Marion counties. The officers are Thomas L. Fekete, president; E. C. Rhodes, vice-president; and W. E. Beckwith, secretary.

Texas Midland.—The track laying on the short extension from Roberts had been completed to within a mile of Greenville, Tex., last week, and has now probably reached that town. A new station to be used jointly with the St. Louis Southwestern is being erected at the cost of $10,000.

Tionesta Valley.—The Tionesta Valley, the Sheffield and Spring Creek, the Cherry Gove and the Warren and Farnsworth roads in Pennsylvania have been consolidated under the name of the Tionesta Valley Railroad, with the principal office at Sheffield, Pa. The officers of the new company are: President, F. Goodyear, Buffalo, N. Y. Vice-President, James H. Horton; Secretary, R. G. Brownell; Treasurer, Charles Sigel; General Manager, Isaac Horton and General Superintendent, J. Crary; all of Sheffield; and a connecting link of about three miles is being built from Tiona to Clarendon. The three roads last named have hitherto been leased to the Tionesta Valley.

Vancouver, Klickitat & Yakima.—One of the officers of the company in a recent report printed in a Seattle paper in regard to the prospects for the extension of this railroad, states that new surveys are to be started without further delay for the proposed extension of the line. The present road extends from near Portland to a point on the Columbia River opposite Vancouver, Wash., about 12 miles. The extension proposed is north from Vancouver to the Klickitat Pass and thence toward the Cascade Mountains, the entire length of the proposed road being 170 miles.

GENERAL RAILROAD NEWS.

Baltimore & Lehigh.—The York & Delta Land Improvement Co., (limited) has filed exceptions in the United States Circuit Court at Philadelphia as a judgment creditor of the railroad company, to the confirmation by the Court of the recent marshal's sale of the property in Pennsylvania of that road. The legality of the judgment of Warren F. Walworth, for $261,873, under which the sale took place, is disputed. The property, it is contended, was sold to the purchaser for an inadequate amount.

Chesapeake, Ohio & Southwestern.—The officers of the Illinois Central announce that that company will assume the operation of this railroad on September 1. It proposes to use that part of the line between Fulton and Memphis as a portion of its through main line to New Orleans, which will hereafter consist, south of Memphis, of the Yazoo & Mississippi Valley Railroad instead of the old line through Jackson, Tenn., and Jackson, Miss. About eight months ago the Louisville & Nashville made an agreement with C. P. Huntington, then controlling the Chesapeake, Ohio & Southwestern, for the purchase of that property, Mr. Huntington agreeing to accept that company's notes endorsed by the Illinois Central Railroad. Afterwards the state of Kentucky brought suit to prevent the Louisville & Nashville operating the Chesapeake, Ohio & Southwestern, claiming that such an arrangement would be unconstitutional, conflicting with the provisions of the state charter forbidding the consolidation of competing railroads. A permanent injunction was issued by the Kentucky courts forbidding the purchase,

and, pending the decision in the appeal taken by the Louisivlle & Nashville, the railroad will be operated by the Illinois Central.

Chicago, Burlington & Quincy.—The earnings for July and the seven months of the fiscal year are given below:

	1894.	1893.	Dec.
Gross earn	$2,456,595	$2,949,373	$492,778
Oper. expen	1,608,232	2,020,975	412,743
Net earn	$848,363	$928,398	$80,035
Fixed Charges	800,000	822,880	22,880
Surplus	$48,363	$105,518	$57,155
For seven months:			
Gross earn	$17,616,734	$21,925,382	4,308,647
Oper. expen	11,461,141	15,182,877	3,721,736
Net earn	$6,155,593	$6,742,505	$586,911
Charges	5,600,000	5,760,166	160,166
Surplus	$555,593	$982,339	$426,745

Denver, Leadville & Gunnison.—Upon application of Receiver Trumbull, Judge Hallett, of the Federal Court at Denver, recently entered an order abolishing the old schedule of pay of employees, upon the ground that the earning capacity of the system will not warrant such high wages and that the property would have to be abandoned if such wage schedule were kept in force. Then the Receiver made a new schedule, changing the pay from a monthly to a mileage basis, materially reducing the rates of wages. A conference with the employees was held and the inequalities of the new schedule were discussed, changed, and the new basis finally accepted. The employed at first talked of opposing the proposed reduction, but after the court's decision, they deemed it wise to accept what seemed inevitable.

Duluth & Manitoba.—The Bondholders' Protective Committee announce that holders of $2,300,000 of the first mortgage bonds have signed the agreement of April 4, and that more than the necessary number of assents to the proposed contract of lease between the receivers of the Northern Pacific and the Duluth & Manitoba have been received.

Evansville & Richmond.—A majority of the bondholders of the railroad company have assented to the plan prepared by Messrs. Harvey Fisk & Sons for the readjustment of the company's indebtedness. This plan provides for the formation of a new company, to be called the Indiana Stone, Railroad & Quarries Co., which will control besides the Evansville & Richmond Railroad, the Bedford Belt road and the Bedford stone quarries.

Louisville & Nashville.—The earnings of the company for the fiscal year ending June 30, are given in the following statement:

	1894.	1893.	Inc. or Dec.
Gross earn	$18,974,337	$22,403,639	D $3,429,302
Oper. expen	11,863,785	14,382,643	D 2,518,858
Net earn	$7,110,552	$8,020,996	D $910,444
Fixed charges	$5,665,636	$5,490,796	I 174,840
Balance	1,444,916	2,530,200	D 1,085,284
Other income	272,288	416,109	D 143,821
Total income	$1,717,204	$2,946,309	D $1,229,105
Loss Geor. R. R.	24,784	70,978	D 46,194
Loss other roads	139,929	127,043	I 12,886
Harding Co. suit	...	225,737	D 225,737
Total losses	$164,713	$423,758	D $259,045
Surplus	1,552,491	2,522,551	D 970,060
Dividends	...	2,112,000	...
Net surplus	$1,552,491	$410,551	...

Pennsylvania.—The report of earnings on the eastern lines for July makes the following comparisons:

	1894.	1893.	Dec.
Gross earn	$4,812,563	$5,605,285	$792,722
Oper. expen	3,403,844	4,074,876	671,032
Net earn	$1,408,719	$1,530,409	$121,690

The gross earnings on Western lines for July decreased $608,223, and net earnings decreased $24,403. For the seven months the earnings of Eastern lines were as follows:

Gross earn	$31,007,467	$39,437,429	$8,429,962
Oper. expen	22,727,933	29,071,457	6,343,524
Net earn	$8,279,534	$10,365,972	$2,086,438

Net earnings in 1892 were $10,250,701; and in 1891, $10,783,265. The gross earnings of the Western lines in seven months decreased $5,251,442, and the net earnings decreased $1,756,648. The system for the seven months shows a gross decrease of $13,681,404, and a net decrease of $3,843,086 in net earnings.

South Jersey.—Francis I. Gowen, of Philadelphia, was appointed Receiver of this road on August 22, by Judge Dallas, of the United States District Court, at Trenton, N. J., in a friendly suit brought by the Harlan & Hollingsworth Co., of Wilmington, Del. The liabilities of the company, exclusive of its bonded indebtedness, amount to about $35,000, but the immediate ground for the receivership was the inability to pay about $12,000 owing to a force of laborers employed in track-laying. The company operates 67 miles of road, consisting of 39 miles from the junction of the Philadelphia & Reading, at Winslow Junction, to Sea Isle City, and 28 miles from Tuckahoe Junction to Cape May. The company was incorporated in New Jersey in 1893.

Tennessee River, Ashville & Coosa.—This road which extends from Ashville to Whitney, Ala., five miles, was sold at Birmingham, Ala., on August 20, to J. E. Zunts, trustee, for $14,000.

Union Pacific.—The exhibit of earnings for June is the poorest ever made by the company. The net earnings show a loss of over $900,000. The heavy decrease is accounted for by the suspension of traffic caused by washouts on the Oregon Navigation lines and other roads, and heavy expenses for repairs, so that operating expenses could not be reduced in anything like the proportion that gross earnings fell off. The report for July will also make a poor showing, but August earnings, it is stated, show a considerable improvement.

GRAND TOTAL OF UNION PACIFIC SYSTEM.

Month of June:	1894.	1893.	Dec.
Gross earn	$2,245,593	$3,343,880	$1,098,287
Oper. expen	2,062,966	2,256,896	193,930
Net earn	$182,627	$1,086,984	$964,357
Mileage	8,212	8,143	69
Since Jan. 1:			
Gross earn	$14,025,580	$19,187,396	$5,161,815
Oper. expen	11,541,761	13,662,465	2,120,703
Net earn	$2,483,819	$5,524,931	$3,041,112

UNION PACIFIC RAILWAY.

June:			
Gross earn	$1,188,197	$1,530,287	$342,089
Net earn	317,796	625,875	308,079
Since Jan. 1:			
Gross earn	6,565,709	8,505,989	1,940,280
Net earn	1,700,579	3,046,343	1,345,763

OREGON SHORT LINE & UTAH NORTHERN.

June:			
Gross earn	$386,613	$610,146	$223,533
Net earn	56,250	293,707	237,457
Since Jan. 1:			
Gross earn	2,350,906	3,199,516	848,610
Net earn	619,179	1,208,193	589,014

OREGON RAILWAY & NAVIGATION CO.

June:			
Earnings	$97,677	$337,961	$240,283
Net earn (def.)	106,871	82,627	189,499
Since Jan. 1:			
Earnings	1,228,091	1,855,509	627,418
Net earn (def.)	176,947	339,918	516,865

UNION PACIFIC, DENVER & GULF.

June:			
Earnings	$200,216	$321,651	$121,435
Net earn (def.)	16,371	38,816	55,548
Since Jan. 1:			
Earnings	1,307,473	1,990,024	682,550
Net earn	201,566	351,124	149,558

Union Pacific, Denver & Gulf.—Receiver Trumbull has filed in the United States Court an application to annul the traffic contract existing with the Denver & Rio Grande Railroad for the use of the line of the latter between Pueblo and Trinidad, and permission is asked to construct an independent line between these two points, a distance of 70 miles. The Gulf system pays $180,000 a year for the use of this track and the receiver thinks a road can be constructed at an interest cost of from $70,000 to $90,000. The court has set October 30, as the date for a hearing upon the application. The Denver & Rio Grande will bitterly contest the application and will try to hold the receiver to the full terms of the contract.

Utica & Unadilla Valley.—Judge Beach of the Supreme Court at New York has appointed Benjamin W. Appleton Receiver for this railroad in New York State, in the proceedings brought by R. Floyd Clark and Frederick T. Culver, judgment creditors.

Valley (Ohio).—The directors of the Wheeling & Lake Erie Company have made a proposal to the bondholders of the Valley Railroad, which has been in default for some years past. The line of the Valley Company extends from the Wheeling & Lake Erie at Valley Junction to Cleveland, about 75 miles, and its acquirement by that company would give it a line of its own from Wheeling to Cleveland. The proposal referred to looks to the retirement of the existing bonds of the Valley Company by giving to each bondholder a new four per cent. first mortgage which will be gauranteed by the Wheeling & Lake Erie, and an income bond of like amount entitled to the surplus revenues of the Valley Company. The Baltimore & Ohio secured a controlling interest in the stock of the Valley Company in January, 1890, and the road was operated as a part of the Baltimore & Ohio system until receivers were appointed in June, 1892.

Washington & Columbia River.—Judge Henford, of the United States District Court, at Tacoma, Wash., appointed President W. T. Tyler receiver for the railroad. This is the second time the road has been in a receiver's hands in the last three years. It comprises 170 miles of track, centering at Walla Walla, Wash., in the wheat district of the state. The property is controlled by C. B. Wright, of Philadelphia.

Wisconsin Central.—Receivers Whitcomb and Morris, of the Wisconsin Central Company and the Wisconsin Central Railroad Company, have filed their reports for the months of April, May and June. The receipts of the railroad company were $165,053, including the May balance, which was $37,069. The disbursements for the same months were $141,860, leaving a balance on hand of $23,192. The receipts for the Wisconsin Central Company for June were $302,112, and the disbursements $112,564.

TRAFFIC.

Traffic Notes.

The Iowa Railroad Commisioners held a hearing at Des Moines on August 21, according to a previous announcement, to consider the application of the railroad companies for authority to increase their freight rates. Mr. Ripley and Mr. Blythe appeared for the railroads and Ex-Railroad Commissioners Campbell and Spencer Smith appeared for the merchants. The hearing was adjourned for a month to give the merchants time to present further arguments.

The Trunk Line, the Central Traffic and the New England roads had a large meeting in New York last week and considered the rate question generally. The result seems to be the same as usual; every one voted to maintain rates and to henceforth behave with the strictest propriety. The principal trouble has been on east bound grain by lake and rail. This has been carried as low as 10 cents per 100 lbs. from Chicago to New York, and the railroads west of Buffalo complain that those east of Buffalo, members of their own households, as it were, favor the lake lines by accepting a much smaller proportion from them than they will take on all rail shipments. The meeting resolved to maintain rates on east bound freight on a basis of 20 cents a hundred, sixth-class, all-rail, and 15 cents on lake and-rail. Recent cuts in eastbound passenger business from Chicago to the Atlantic seaboard were discussed briefly, and referred for settlement to the managers of the Chicago lines. The division of freight through St. Louis and Peoria by cut rates was considered at the meeting but no result reached.

The passenger department of the Chicago & Northwestern has prepared a statement showing the increase in travel between Chicago and Ravenswood, a suburban station about six miles from the city, for the past twenty years. During the year 1874, 26,980 passengers were carried by this line between Chicago and Ravenswood, an average of 74 a day. During the year 1884 the total was 164,018, an average of 449 per day, and for the year 1894 the total will be 917,938, or an average of 2,514 per day.

The Pennsylvania Railroad for the week ending August 18, moved an unusually large quantity of coal and coke, showing a revival in manufacturing industries, especially iron, along the lines of its railroad system. The total tonnage of anthracite, bituminous and coke carried over the lines of the Pennsylvania Railroad east of Pittsburg and Erie for that week exceeded 400,000 tons. The figures of the year 1894 to August 11, showed that the Pennsylvania Railroad's total tonnage of coal and coke had fallen off 3,676,185 tons as compared with the corresponding period of last year, but the gain for the week ending August 18 has reduced this loss of tonnage about 150,000 tons, the increased movement of coal being nearly 100,000 tons, while that of coke exceeded 50,000 tons.—Philadelphia Ledger.

Chicago Traffic Matters.

CHICAGO, August 29, 1894.

Freight traffic the past week has shown considerable increase, both east and west, and a still further increase is probable the coming week. Rates are being generally well maintained. There are, as usual, rumors of cuts in various directions, but apparently none are serious enough as yet to disturb the general rate situation.

Lake rates are firmer and advancing under pressure for tonnage rather than because of any marked increase in business. This is especially true of the grain carrying trade, which finds it difficult to obtain boats. Lumber rates are firmer for the same reason. There is a slight increase in shipments from the Lake Superior region, but the light demand for building materials will probably keep down any large increase. Westbound business is growing heavier each week, and with the coal carrying trade taking most of the tonnage, rates are likely to be well maintained during the balance of the season. Trade conditions are bringing about what the vessel owners desired to do early in the season, but were afraid to, restrict tonnage and force the entire business of the season into a few months.

Chicago grain dealers are protesting at the action of the Illinois Central in meeting the tariffs of the Chicago & Eastern Illinois and establishing the Chicago basis from Kankakee. The trouble is that under the present adjustment of tariffs on the sums of locals the rate via Chicago is 3 cents higher than via Kankakee. Under the old arrangement, which was terminated when the Central Traffic lines withdrew the through rates some months ago, the rate via Chicago was one cent higher per 100 pounds via Chicago than via the lower crossings. This the Chicago men did not object to particularly, as grain would still come here to take advantage of better facilities for grading and weighing, but they say that the difference of 3 cents per 100 is prohibitory.

A conference of trans-continental lines is now in session in this city considering the advisability of resurrecting the old trans-continental association. There is no possibility of this being accomplished at present. There are numberless differences which must first be settled, and both the Union Pacific and Atchison are disinclined to join an association at present. Especially is this true of the Atchison, and until the new receiver qualifies there is likely to be no serious consideration of the question on its part.

Eastbound rates are seriously menaced by the action of the Atchison and the Erie in publishing a tariff quoting 29 cents on packing house products, from the Mississippi River to New York, against the agreed rate of 35 cents. These roads claim that they were forced to take this action on account of secret cuts of competitors, which they, being in receivers' hands, could only meet openly. The Central Traffic Association is making strenuous efforts to get the tariff withdrawn.

The Central Traffic Association lines were successful in protecting their rates for the Knights of Pythias excursion against the attempt of the Missouri, Kansas & Texas to force them to pro rate on its rate of $25 for the round trip from all Texas points on its line. The latter was forced to supply its passengers with round-trip tickets purchased at St. Louis at the agreed rate of $20.50, thus leaving for the long haul from Texas and back only $4.50. Consequently, the officials of the association view their success with considerable satisfaction.

The Wabash and Rock Island have been requested by the chairman of the Western Passenger Association to redeem a number of their tickets found on the market here disturbing rates.

The State Board of Railroad Commissioners in Iowa, after hearing the petitions of the roads for an increase in the maximum rates, took an adjournment for four weeks, requesting the roads in the meanwhile to prepare and file schedules of the rates which they desire.

Both the Atchison and Burlington have recently brought in heavy excursions from local Illinois points, notably from Streator. The Burlington brought in over 2,000 on August 26.

The deaths of President Newell of the Lake Shore and General Passenger Agent Chandler of the Wabash have caused the postponement of a number of conferences and meetings to consider various questions which are pending between the western and eastern line.

The announcement of the sudden death of President Newell was a great shock to his many friends in this city, as elsewhere. While his headquarters were officially at Cleveland, he was to be found at his office in this city, where his home was, quite as often as at Cleveland.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines for the week ending August 25, amounted to 47,161 tons, against 45,589 tons during the preceding week, an increase of 1,572 tons, and against 43,992 tons for the corresponding week last year. The proportions carried by each road were:—

Roads.	W'k to Aug. 25.		W'k to Aug.	
	Tons.	P. c.	Tons.	P.c.
Michigan Central	6,411	13.6	4,330	9.4
Wabash	3,862	8.2	3,772	8.3
Lake Shore & Mich. South	3,855	8.1	6,096	13.4
Pitts., Ft. Wayne & Chicago	4,702	9.9	5,602	12.3
Pitts., Cin., Chicago & St. L.	5,994	12.7	6,744	14.8
Baltimore & Ohio	2,870	6.1	2,642	5.8
Chicago & Grand Trunk	4,746	10.1	4,218	9.3
New York, Chic. & St. Louis	5,627	11.9	6,028	13.2
Chicago & Erie	7,141	15.2	4,636	10.2
C., C., C. & St. Louis	1,953	4.2	1,521	3.3
Totals	47,161	100.0	45,589	100.0

Of the above shipments 2,318 tons were flour, 12,429 tons grain and millstuff, 10,087 tons cured meat, 10,994 tons dressed beef, 1,323 tons butter, 1,937 tons hides and 4,895 tons, lumber. The three Vanderbilt lines carried 33.6 per cent., the two Pennsylvania lines 22.6 per cent. Lake lines carried 45,724 tons, against 47,670 tons last week.

Southern Railway and Steamship Association.

At the meeting of this Association at Manhattan Beach, N. Y., on August 25, the old officers were re-elected for the ensuing year as follows Joseph E. Brown, of Atlanta, president; J. W. Thomas, Nashville, vice-president; E. B. Stahlman, commissioner; W. L. McGill, secretary; Thomas H. Carter, John Scriven, and J. W. Green, arbitrators. The reporters do not succeed in learning much about what was done in the way of settling rate questions at the meeting. The Alabama, Great Southern, the Seaboard Air Line, the Mobile & Ohio and some other roads had not joined the Association for the ensuing year, which would indicate that the usual differences remain to be adjusted.